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Race, Personal History Characteristics, and Vocational Rehabilitation Outcomes: A Structural Equation Modeling Approach

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Race, Personal History Characteristics, and Vocational Rehabilitation Outcomes: A Structural Equation Modeling Approach

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Dedication

Dedicated to Carol.

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Race, Personal History Characteristics, and Vocational Rehabilitation Outcomes: A Structural Equation Modeling Approach

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Numerous studies have indicated racial and ethnic disparities in the vocational rehabilitation (VR) system, including differences in eligibility, services provided, and employment outcomes. Few of these studies, however, have utilized advanced multivariate techniques or latent constructs to measure quality of employment outcomes (QEO) or tested hypothesized models for the relationship between race, personal history characteristics, and VR outcomes. Furthermore, few VR disparities studies have examined southwestern states such as Texas, which has large Hispanic and Black populations.

The purpose of this study was to utilize structural equation modeling (SEM) to examine several implied conceptual models for the relationship between race, personal history characteristics, and VR outcomes for White, Black, and Hispanic participants in the Texas VR system. The implied conceptual models were tested for goodness of fit and multiple-group invariance. A measurement model for QEO, a latent construct, was tested and used in the study. QEO was measured by three indicator variables and

evaluated using confirmatory factor analysis. A MIMIC model was tested to assess racial/ethnic variation in QEO. The MIMIC results were compared to a multiple regression approach. In addition, a path model and logistic regressions were conducted to assess racial variation in VR closure status among consumers who were unemployed at application to VR. All models were retested with an independent sample to assess predictive validity.

The study results indicated good model fit and measurement invariance for the QEO construct. The structural model for race, personal history characteristics, and QEO indicated moderate model fit. It also indicated interaction effects for race by gender and for race by public support. The MIMIC model results suggest that QEO decreased for Blacks and Hispanics compared to Whites. Furthermore, the MIMIC results, which utilized QEO as an endogenous variable, differed from the multiple regression findings, which utilized one criterion. The multiple regression findings indicated no statistically significant difference between Blacks and Whites. The path model for race and VR closure status indicated poor model fit. The logistic regression indicated no racial/ethnic differences in VR closure status. Several model estimates did not cross-validate. Study limitations and suggestions for future research are described.

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CHAPTER 1 INTRODUCTION

Employment matters to people with disabilities. Employment, particularly competitive work, is intrinsically tied to Americans' social identity, livelihood, social acceptance, value system, and feelings of self-worth (Bryan, 1999; National Council on Disability, 2008). Employment rates are low for people with disabilities, however. Only 3 out of every 10 individuals with disabilities are working full- or part-time, and two thirds of individuals with disabilities who are not working would like to be working (National Organization on Disability, 2000; Stapleton & Burkhauser, 2003).

Many people with disabilities rely on state-federal vocational rehabilitation (VR) programs to facilitate employment success (Justesen, 2002; Rubin & Roessler, 2001). The VR system's importance is reflected, in part, by its size and scope. More than 600,000 consumers—that is, clients with disabilities—apply for VR services annually nationwide (Bruyère et al., 2002). VR counselors, who are the primary service providers, administer the VR program at the state level. VR counseling includes coordinated use of medical, social, educational, and vocational measures for training or retraining an individual to the highest possible level of functional ability (Rubin & Roessler, 2001). For eligible consumers, the counselors can offer a plethora of information and services on such topics as employment, counseling, assistive technology, mental or physical restoration, prosthetic or orthotics devices, and job-search or job-placement assistance. Counselors also coordinate training-related services including vocational assessment and postsecondary education (including graduate level coursework) (Rubin & Roessler, 2001; Schaller, Yang, & Chien-Huey Chang, 2004). Most VR services are provided at no cost to the consumer, particularly when financial need is demonstrated (Rubin & Roessler, 2001). Thus, the potential benefit and value of

VR is not in great dispute—VR is a valuable and contributory public program (Bryan, 1999).

Although VR can facilitate successful employment outcomes, it is not a perfect system. Since 1938, researchers have conducted large-scale database studies and reported racial disparities in the system (Atkins & Wright, 1980; Capella, 2002; Walker, Ashbury, Rodriguez, & Saravanabhavan, 1995; Wheaton & Hertzfeld, 2002; Wilkerson & Penn, 1938; Wilson, 2005; Wilson & Senices, 2005a). Scholars have also synthesized the body of VR disparities research and subsequently reported that racial minorities are

- less likely to be accepted for VR services;
- more likely to receive fewer services;
- provided fewer opportunities (e.g., job placement and restoration);
- more likely to have fewer cost expenditures;
- less likely to attain successful employment outcomes; and
- more likely to be unsuccessfully closed due to "failure to cooperate."

Of further concern, reports of racial disparities have persisted despite national policy initiatives such as Section 21 of the Rehabilitation Act Amendments of 1992, which emphasized the need to improve rehabilitation research and practice related to racial and ethnic disparities in disability and rehabilitation outcomes (Rehabilitation Act Amendments, 1992).

To examine racial disparities and VR outcomes, many scholars use the RSA 911, an archival administrative dataset. The RSA 911 is one of the most commonly used large-scale data sources for research and evaluation on disability and the vocational rehabilitation system (Bruyère & Houtenville, 2006). Secondary analysis of VR data represents a practical and cost-effective strategy for conducting research with large samples of participants who enter and exit the VR system (Bruyère & Houtenville,

2006; Lacey & Hughes, 2007). Many of the previous studies on racial disparities and VR outcomes, however, have used the Pearson Chi-square (χ^2) or regression with one observed variable as the criterion. Few studies have utilized advanced multivariate techniques or latent constructs to measure quality of employment outcomes (QEO), or tested implied conceptual models for the relationship between race, personal history characteristics, and VR outcomes. In addition, few published studies have examined racial disparities using VR data from southwestern states such as Texas, which has relatively large Hispanic and Black populations (LeBlanc & Smart, 2007).

Purpose of Study

The purpose of this study is to utilize new multivariate techniques to examine an old question: Are there still racial disparities in VR outcomes? This study utilized RSA 911 data from fiscal year 2006 and structural equation modeling (SEM) techniques. SEM is a comprehensive strategy for testing implied conceptual models for the interrelationship among variables and latent constructs (Kline, 2005). This study tested and explored several implied conceptual models for the relationship between race, personal history characteristics, and VR outcomes for White, Black, and Hispanic participants in the Texas VR system. In SEM, models are illustrated and used to convey the structural relationships and the statistical statements regarding variables and constructs of interest (Kline, 2005; Weston & Gore, 2006). The SEM approach for the present study included confirmatory factor analysis (CFA), multiple group analysis, and multiple indicator multiple cause (MIMIC) analysis. CFA was used to test the measurement model for QEO, a latent variable used in this study. The implied conceptual models were tested for goodness of fit, multiple-group invariance, and racial variation on the QEO factor. In addition, the "new" MIMIC model technique was

compared to "old" linear regression models to compare results between "new" and "old" statistical techniques.

This study also posed questions about racial variation in successful VR closure for participants who were unemployed at application to VR. Successful VR closure—that is, an employment outcome—is considered a primary indicator of VR program success, in addition to weekly earnings (Rehabilitation Services Administration, 2008). It is a particularly useful outcome measure, as it assesses the VR program's impact on consumers who entered without employment (RSA, 2008). However, prior VR racial disparities research has not tested variables related to VR closure status for participants who were unemployed at application.

Research Questions

This study addressed the following four primary research questions and six sub-questions about implied conceptual relationships between race, personal history characteristics, and VR outcomes (QEO and closure status):

1.0 Does the implied measurement model for QEO fit the observed data for multiple racial and ethnic groups?

1.1 If not, how does the QEO measurement model vary by race/ethnicity?

2.0 Does the structural model regressing QEO on personal history characteristics fit the observed data for multiple racial and ethnic groups?

2.1 If not, how does the structural model vary by race/ethnicity?

3.0 Does the MIMIC model indicate racial/ethnic group differences in QEO?

3.1 How does the regression model with weekly earnings as the endogenous variable compare to the MIMIC model?

3.2 How does the regression model with hourly wages as the endogenous variable compare to the MIMIC model?

4.0 Does the structural model regressing VR closure on personal history characteristics fit the observed data for multiple racial and ethnic groups?

4.1 If not, how does the regression model vary by race/ethnicity?

4.2 Does the regression model indicate racial/ethnic group differences in closure status?

Variables

In the language of structural equation modeling, predictor variables are described as exogenous and criterions are known as endogenous. Exogenous variables can be observed variables, latent constructs, or indicators that have a direct effect on other variables. True exogenous variables are not directly influenced by other variables. Conversely, any variable that is directly influenced by another variable is described as endogenous (Kline, 2005).

This study included six exogenous variables that pertain to consumers' personal history characteristics: (1) race/ethnicity, (2) gender, (3) public support, (4) education level at application, (5) earnings at application, and (6) significant disability. Previous research suggests that these variables can influence VR employment outcomes (Bellini, Neath, & Bolton, 1995; Bolton, Bellini, & Brookings, 2000; Capella, 2002; Humphreys & Provitt, 1980; Walker et al., 1995). Five endogenous variables were included in this study: (1) QEO, (2) weekly earnings at closure, (3) medical insurance provided through employment, (4) hourly wages at closure, and (5) closure status. The latent endogenous variable, QEO, consisted of three indicator variables, which were also defined as endogenous.

RACE/ETHNICITY

Race/ethnicity is an exogenous variable measured by self-identification reported in the RSA 911 (1 = White, 2 = Black, 3 = Hispanic). Self-identification with a racial or ethnic group suggests that individuals may identify with or accept the groups' cultural beliefs, norms, or behaviors (LaVeist, 1994; Samovar & Porter, 2001). Race typically pertains to physical appearance, phenotypes, or "signs of essential difference." Race/ethnicity has a strong influence on our interactions, identity development, perception, and beliefs (Alston, Gayles, Rucker, & Hobson, 2007; Prager, 1987; Sheldon & Parker, 1992; Sue & Sue, 2008). Although it is true that VR applicants can self-identify with multiple racial and ethnic groups, this study focused on VR participants who reported one race or ethnicity. It is important to note that race, as a biological-genetic concept, has limited scientific validity. There are greater genetic variations within races than between them (LaVeist, 1994). Although race carries little scientific validity, it has tremendous social validity (LaVeist, 1994; Prager, 1987; Samovar & Porter, 2001; Sheldon & Parker, 1992; Sue & Sue, 2008). Race/ethnicity can influence the manner in which individuals tend to understand, make sense of, or adjust to disability or the rehabilitation process (Smart & Smart, 1993). Individuals who reported multiple racial/ethnic groups were not included in this study, as the sample size was too small for analysis.

White

White is a racial group status and a term that is often used interchangeably with Caucasian or European American. The U.S. Census Bureau (2001) defines *White* or *Caucasian* as a person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

Black

A person who is *Black* or *African American* has origins in any of the Black racial groups of Africa. This definition includes native-born Black Americans, Africans, Haitians, and non-Spanish speaking persons from the Caribbean Islands of African descent (U.S. Census Bureau, 2001).

Hispanic

The RSA (2006) categorizes *Hispanic* as an ethnicity, not a race. The term *Hispanic* refers to people born in North America, Central America, South America, and the Caribbean whose language is Spanish. A *Hispanic* is a person of Mexican, Puerto Rican, Cuban, Central American, South American, or other Spanish culture of origin, regardless of race (U.S. Census Bureau, 2001).

SIGNIFICANT DISABILITY

Significant disability is a binary categorical variable (0 = no, 1 = yes). Individuals with a significant disability have impairments that (1) seriously limit one or more functional capacities in terms of employment outcomes and (2) would likely require extended and multiple VR services. Persons with significant disabilities often have one or more physical or mental disabilities (RSA, 2006).

GENDER

Gender is a binary categorical variable (0 = male, 1 = female).

EDUCATION LEVEL AT VR APPLICATION

Education level is a nominal variable with five categories (0 = less than high school [LTHS], 1 = high school diploma or certification [HS], 2 = more than high school [MTHS], 3 = associate's or technical degree, and 4 = bachelor's degree or higher). Several researchers have emphasized the benefit of using education

credentials—that is, degree or diploma—as a key component of the education variable (Krieger, Williams, & Moss, 1997). Generally, people with higher education are more socially advantaged, obtain higher wages, and are employed at higher rates compared to individuals who drop out or only have a high school diploma (Baker, Mixner, & Harris, 2007). For this study, individuals were coded as LTHS if their highest education level was special education or special education certification.

WEEKLY EARNINGS AT APPLICATION

Weekly earnings are defined as the dollar amount received for work at the time of application to VR, including wages, tips, and other income before taxes (RSA, 2006).

PUBLIC SUPPORT

Public support is defined as the receipt of any cash payments made by governmental programs (0 = no, 1 = yes). Consumers who responded "yes" to any of the following forms of assistance were coded as receiving public support: Supplemental Security Income (SSI), Social Security Disability Insurance (SSDI), Temporary Assistance for Needy Families (TANF), General Assistance (GA), workers' compensation, veterans' disability benefits, and any other public support.

QUALITY OF EMPLOYMENT OUTCOMES (QEO)

As previously stated, QEO is an endogenous latent construct defined and measured by three observed indicator variables: (1) weekly earnings at closure, (2) medical insurance provided through employment, and (3) hourly wages at closure. These indicator variables were hypothesized to reflect QEO (Cartwright & Kim, 2006; Gilbride, Thomas, & Stensrud, 1998; Loprest, 2007). The National Council on Disability (2008) recommends these types of indicators because they are independent of

personal evaluation, are more measurable and are impacted by public policy. CFA was used to test the QEO construct (Kline, 2005).

WEEKLY EARNINGS AT CLOSURE

Weekly dollar amount earned after successful completion of the VR program is a continuous variable. Weekly earnings assess economic productivity and the well being of individuals (NCD, 2008).

MEDICAL INSURANCE PROVIDED BY EMPLOYER

Medical or health insurance provided through employment is a binary categorical variable (0 = no, 1 = yes).

HOURLY WAGES AT CLOSURE

Hourly wages is a continuous variable for dollars per hour received for work.

CLOSURE STATUS

Closure status is a binary categorical variable (0 = unsuccessful, 1 = successful). Successful closure means an employment outcome, whereas unsuccessful closure reflects a non-employment outcome.

Definitions of Terms and Symbols

Confirmatory factor analysis (CFA): CFA is a strategy for analyzing an a priori measurement model in which the factors and indicators are explicitly stated (Kline, 2005).

Cross-validation: Cross-validation is a technique for testing two or more independent random samples from the same population. Cross-validation is often used in multivariate research to test, refine, and retest implied and modified conceptual models.

Latent variable: Latent variables or constructs are hypothetical and unmeasured variables with characteristics that cannot be observed and are measured by an underlying pattern of indicator variables. Latent constructs are also known as "factors" (Kline, 2005).

Model: A model is a statistical statement about the relationship among a set of variables of interest (Hoyle, 1995).

Multiple Indicator Multiple Cause (MIMIC): MIMIC is a structural equation modeling strategy for estimating group differences on latent variables (Kline, 2005).

Observed variable: An observed variable is a variable that can be measured. Observed variables can operate as exogenous or endogenous variables, or as indicators for latent constructs (Kline, 2005).

Rehabilitation Services Administration (RSA): The RSA is a U.S. government agency within the Department of Education that oversees grant programs that help individuals with physical or mental disabilities obtain employment and independence.

RSA-911 Case Report Service: The RSA 911 is the Rehabilitation Services Administration's annual administrative data set. The RSA 911 includes extensive demographic and case services data on all VR consumers from each state, the District of Columbia, and the U.S. territories. It is a key resource for VR program evaluation and research on employment outcomes (Bruyère & Houtenville, 2006).

Status 26: The VR uses codes to indicate case status. Status 26 is used to indicate a successful case closure for a consumer, which means a job with maintained employment for a minimum of 90 days (RSA, 2006).

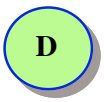
Structural equation modeling (SEM): SEM is a comprehensive strategy for testing hypotheses about the interrelationship among variables and latent constructs (Kline, 2005). In SEM, illustrations are used to convey the implied structure of

relationships and the statistical statements regarding variables and constructs of interest (Kline, 2005; Weston & Gore, 2006).

Vocational rehabilitation (VR): The VR program is the primary state-federal vehicle for assisting individuals with disabilities in obtaining employment.

Vocational rehabilitation counseling: VR counseling consists of therapeutic and coordination activities designed to assist individuals with disabilities in achieving an employment outcome. VR counselors are professionals who work with consumers to develop a rehabilitation plan for employment that is consistent with the individual's strengths, resources, priorities, concerns, abilities, capabilities, interests, and informed choices (Rubin & Roessler, 2001).

Table 1. Common Symbols for Structural Equation Modeling

Symbol	Description
	A rectangle represents an observed variable or indicator.
	An oval or circle represents a latent variable or unobserved variable.
	A one-headed arrow indicates a direct path between variables.
	Bi-directional arrows (curved or straight) indicate a covariance or correlation between variables.
	The symbol *e* is used to denote measurement error for an observed variable.
	The symbol *D* is used to denote disturbance. A disturbance is similar to measurement error; however, it specifically refers to the unexplained variance for an endogenous variable.

CHAPTER 2

LITERATURE REVIEW

This chapter describes the background and context for VR racial disparities research and synthesizes empirical research literature on VR disparities (Cooper, 1998). The review of empirical research focuses on RSA 911 studies published since 1992, a year coinciding with the passage of Section 21 of the Rehabilitation Act Amendments of 1992, a major policy initiative designed to address racial disparities in VR. Several resources were investigated to locate articles for this review, including electronic databases, ancestry searches, and gray literature (Schlosser, 2007). Electronic databases (Web of Science, Dissertation Abstracts, PsycINFO, Academic Search Premier, ERIC, Communication and Mass Media Complete, and Vocational and Career Collection) were searched for relevant articles using a combination of such search terms as *rac*, ethnic, cultur*, multicultural, intercultural, rehabilitation counsel*, vocational rehabilitation, minority, divers*,* and *vocational education*. This chapter concludes with implications for new research.

A Brief History of VR Services

To understand the VR system and the rationale for research on racial disparities, it is useful to review the background and context of VR. First, there are different types of rehabilitation programs (e.g., medical and vocational) and various organizations and funding sources that support rehabilitation services (e.g., federal, state, private, and the Department of Veterans Affairs) (Berkowitz & Dean, 1998). Although the organizations and funding sources for rehabilitation can overlap, the central focus of this study was the U.S. Department of Education's Rehabilitation Services Administration (RSA) and

its federal and state funded VR programs. VR programs, also known as restoration, are well established in American history and public policy (Justesen, 2002; Scotch, 2001). The current VR system is a descendant of several philanthropic and legislative initiatives, including the 1917 Smith-Hughes Act, which established vocational education, and the 1918 Smith-Sears Soldiers Rehabilitation Act, which established rehabilitation services for soldiers returning from World War I. These landmark initiatives led to the Smith-Fess Act of 1920, a policy that extended vocational guidance and job placement assistance to the non-veteran U.S. population (Justesen, 2002; Scotch, 2001).

During the formative years, federal and state VR programs were primarily for persons with physical disabilities. Over time, rehabilitation services were extended to persons with mental retardation and more severe disabilities through initiatives such as the Barden-LaFollette Act (Berkowitz & Dean, 1998; Scotch, 2001). Initiatives to increase VR services for persons with severe disabilities also reflected a backlash against relatively disempowering service delivery models that often segregated people with disabilities in sheltered workshop environments without efforts to maximize employment potential (Rose, 2007).

From a contextual perspective, VR is intended to help individuals return to work or gain new employment, as opposed to simply providing cash payments or insurance (Scotch, 2001). According to Rose (2007), VR serves mutually beneficial functions: it is a mechanism to help individuals rejoin the mainstream society, a strategy to reduce federal spending on public support, and a means of generating additional tax revenue.

The Modern VR System

The current state-federal VR system is made possible by the Rehabilitation Act of 1973, a broad post-civil rights era legislation designed to provide VR counseling programs to all eligible consumers on an equal basis (Justesen, 2002). Although the Rehabilitation Act addresses multiple issues, including federal employment (Section 501), employment discrimination (Section 505), and technology access (Section 508), its provision of VR services is most germane to this study (Bruyère et al., 2002). Of particular relevance for this study is the fact that the Rehabilitation Act was amended in 1992 and again in 1998 to provide additional attention and policy directives for addressing the needs of persons with severe disabilities and persons from cultural and linguistically diverse backgrounds (Rehabilitation Act, 1992).

As a social and governmental service, the VR system is best described as an eligibility-based system (Schaller et al., 2004). In other words, the VR system differs from other major programs for people with disabilities, such as services provided under the Individuals with Disabilities Education Act (IDEA). Unlike IDEA, which is an entitlement program, consumers must apply and become eligible to receive VR services. VR eligibility requires three qualifications: (1) the consumer must have a qualified physical, sensory, cognitive, or intellectual disability; (2) the consumer's disability may not significantly prevent employability; and (3) the consumer can effectively benefit from VR to gain competitive employment (Bruyère et al., 2002; Rubin & Roessler, 2001). VR programs are administered at the state level, and VR counselors coordinate the VR eligibility and determination process (Chan, Berven, & Thomas, 2004). The determination process typically includes additional assessment about disability, a review of the consumer's history, and a mutually devised individual plan for employment (IPE) (Rubin & Roessler, 2001). Using the IPE as a guide, the VR

counselor aims to facilitate placement in competitive employment and "maximize employability, independence, integration, and participation of people with disabilities in the workplace and the community" (Parker, Szymanski, & Patterson, 2005, p. 28). As such, the written IPE and subsequent VR services can be described as an intervention with an expectation or expected outcome of satisfactory performance in employment (Colling & Davis, 2005).

VR Disparities Research

Though VR can facilitate successful employment outcomes, it is not a perfect system (Bryan, 1999; Chan, Tarvydas, Blalock, Strauser, & Atkins, 2009). All VR consumers should receive a fair intake process and, if deemed eligible for services, receive equal treatment under the auspices of VR, regardless of race or ethnicity (Justesen, 2002). Several studies have indicated that racial and ethnic disparities exist in the VR system, however. This includes differences in eligibility, services provided, types of closure, and employment outcomes (Atkins & Wright, 1980; Capella, 2002; Chan, Wong, Rosenthal, Kundu, & Dutta, 2005; Rosenthal, Ferrin, Wilson, & Frain, 2005; Wilkerson & Penn, 1938; Wilson, Jackson, & Doughty, 1999). The persistent reports of VR disparities are a major concern, particularly in light of the projected changes in U.S. demographics, disproportionate rates of disability among culturally diverse populations, and the relatively homogenous population of VR counselors (Kundu, Dutta, & Walker, 2006; LeBlanc & Smart, 2007).

According to the 2000 U.S. Census report, racial and ethnic minorities represent 30% of the American population, and this figure is expected to increase to 40% by 2030 (Freedman, Martin, & Schoeni, 2004). Among the 54 million Americans age five and older reporting a disability, more than 7 million were African Americans and nearly 7

million were Hispanic. Overall, Blacks, American Indians, and Alaska Natives were most likely to report a limitation or disability—24% compared to 19% for all races in 2000 (Freedman et al., 2004). Asians and Whites reported relatively low rates of limitations and disability—17% and 19%, respectively. Although Asian cultural groups present the lowest rates of disability, many scholars suggest this is due to underreporting or the unwillingness to acknowledge a disability (Ro, 2000). The impending changes in the U.S. population and large percentages of racial minorities with disabilities suggest the potential for an increasing proportion of racially discordant counseling interactions in the VR system and the need to understand and ameliorate racial disparities in VR (Kundu et al., 2006; Leung, Flowers, Talley, & Sanderson, 2007; Middleton et al., 2000).

Racially discordant interactions are also likely to occur due to the demographic makeup of VR counselors. Although the percentage of racial/ethnic minority counselors has increased in recent years, the majority of VR counselors (nearly 92%) and the majority of masters-level pre-service rehabilitation counseling students are White (Kundu et al., 2006). These counselors may not have the cultural knowledge, skills, awareness, or experiences to provide effective multicultural rehabilitation counseling (Alston et al., 2007; Bellini, 2003; Bryan, 1999; Leung et al., 2007; Middleton et al., 2000). Though racial similarity between a counselor and a consumer is not required for achieving a successful employment outcome, many White pre-service counselors may consciously or unconsciously hold negative perceptions of Black consumers' potential for employment and educational success (Rosenthal & Berven, 1999).

Within the counseling profession there are also intercultural communication barriers. Many counseling professionals use a low-context communication style that emphasizes verbal communication and intimate face-to-face expressions of feelings,

beliefs, and relationships (Bryan, 1999; Jandt, 2004; Sue & Sue, 2008). In low-context communication, explicit language is valued. However, low-context communication may be inappropriate or inconsistent with many cultures (Bryan, 1999; Sue & Sue, 2008). Many high-context cultural groups, such as Hispanic or Asian American families, may eschew low-context approaches (Bryan, 1999; Smart & Smart, 1992).

DISABILITY-SPECIFIC VR DISPARITIES RESEARCH

This study focused on race/ethnicity as the primary grouping variable and emphasis of concern. Many scholars have conducted VR outcomes research with a primary focus on race or ethnicity and specific disability categories such as mental retardation (Moore, Feist-Price, & Alston, 2002), traumatic brain injury (da Silva Cardoso, Romero, Chan, Dutta, & Rahimi, 2007; Whitfield & Lloyd, 2008), autism (Schaller & Yang, 2005; Chan, Dutta, Kundu, Chou, & Lee, 2008), specific learning disabilities (Dunham, 1998), depressive/mood disorders (Schaller & Yang, 2007), deaf/hard of hearing (Moore, 2002), or visual impairments (Giesen, Cavenaugh, & Sansing, 2004). Most of these studies reported racial disparities in which Whites were more likely to be accepted to VR or successfully closed with an employment outcome. Several studies, however, particularly those on sensory disabilities, reported mixed or conflicting findings regarding racial disparities. The findings from these disability-specific studies suggest that additional insight about VR outcomes can be culled from examining race and primary disability.

RSA 911 DATA AND RACIAL DISPARITIES RESEARCH

To examine VR disparities, many researchers utilize the RSA 911, the annual administrative data set for the Rehabilitation Services Administration. As stated above, the RSA 911 is a national data collection effort and a key resource for VR program

evaluation and research on employment outcomes (Bruyère & Houtenville, 2006). The RSA 911 is useful as it includes extensive demographic and case-services data on all VR consumers from each state, the District of Columbia, and the U.S. territories (RSA, 2006). As such, research using the RSA 911 can provide an indication of the VR program's acceptance rates, service delivery patterns, and intended outcomes (i.e., employment) at the national and state levels.

SEMINAL RESEARCH ON RACIAL DISPARITIES

Among the many VR studies on racial disparities, research by Atkins and Wright (1980) is widely regarded as the first seminal study. They analyzed the 1976 VR data and reported that Black applicants were less likely to be accepted for VR as compared to White applicants. When Blacks were accepted to VR, their average costs of services—that is, expenditures—were less compared to Whites. The authors selected large sample sizes, ranging from a minimum of 354 Blacks and 9,670 Whites to a maximum of 59,383 and 225,591, respectively. Atkins and Wright's study was influential and groundbreaking as one of the first studies in the modern era, subsequent to the Rehabilitation Act of 1973, to indicate significant and detrimental VR outcomes for Black consumers. Although their study was groundbreaking, there were several limitations to their statistical design and analysis (Bolton & Cooper, 1980). Bolton and Cooper refuted Atkins and Wright's study, stating that socioeconomic status (SES) and low education level were stronger predictors of VR outcomes for Black applicants. In short, Bolton and Cooper suggested that due to the fact that Black consumers were lower on most social indictors at the start of VR services, they were more likely to have poorer outcomes. In a rebuttal to Bolton and Cooper's criticism, Atkins and Wright explained that Blacks' relatively lower SES, or social indicators, substantiated the need for VR to improve its cultural competence and service delivery for Blacks. Recently,

Atkins (Leung & Atkins, 2007) reflected on the controversy and attention surrounding the groundbreaking study, stating the following:

> The article was not published after acceptance for the reader to draw their own conclusions about the validity of the data and their implications, as is generally the case. The *Journal of Rehabilitation* editors sought out two additional reactions or responses. In what was perhaps an unprecedented act, commentary from the RSA Commissioner and Deputy Commissioner, along with invited comments from two other researchers were obtained. Given the implied criticism of the public rehabilitation program by Atkins and Wright (1980), this certainly seemed a somewhat transparent and defensive way to lessen the impact. (p. 9)

Since Atkins and Wright's (1980) seminal publication, many scholars have examined VR racial disparities using stronger statistical designs and have reported similar results. In doing so, these researchers have drawn more attention to racial disparities in VR outcomes. The attention to VR disparities, as well as related advocacy efforts, has made an impact on VR policy and rehabilitation counseling practice, as evidenced by Section 21 of the 1992 Rehabilitation Act Amendments and recommendations for cultural competence for VR counselors and pre-service counselors (Leung et al., 2007; Middleton, Flowers, & Zawaiza, 1996; Middleton et al., 2000).

PREVIOUS REVIEWS OF LITERATURE

Several authors have conducted literature reviews and meta-analyses on racial and ethnic disparities in VR that have contributed to the knowledge base (LeBlanc & Smart, 2007; Leung et al., 2007; Rosenthal et al., 2005; Wilson, Harley, McCormick, Jolivette, & Jackson, 2001). The narrative literature reviews, particularly the recent book chapter by Atkins and Leung (2007), offer a broad historical perspective on multicultural rehabilitation issues in VR and include a summary of research on VR disparities. Rosenthal et al. (2005) conducted a meta-analysis to aggregate the effect sizes of several VR acceptance studies. They reported that Whites were 1.54 times more

likely to be accepted to VR compared to Blacks and Hispanics. They also summarized the most common reasons racial/ethnic minorities were not successfully closed, reporting that Blacks and Hispanics were closed most frequently for "failure to cooperate" and "refused services." "Failure to cooperate" is an RSA administrative code "to indicate when an individual's actions (or non-actions) make it impossible to begin or continue a VR program" (RSA, 2006, p. 40). The code can also be used when consumers fail to keep appointments. The code "refused services" refers to "individuals who choose not to participate or continue in their VR program at this time" (RSA, 2006, p. 40). In aggregate, the previous literature reviews indicate evidence of racial and ethnic disparities in VR and suggest that disparities are historically grounded and persistent. Most of these literature reviews conclude with recommendations for cultural competence training as a strategy to ameliorate VR disparities. Recent research funded by the National Institute on Disability and Rehabilitation Research (NIDRR) and conducted by Fabricio Balcàzar and colleagues at the Center for Capacity Building on Minorities with Disabilities Research has examined strategies to tailor, implement, and evaluate cultural competence training in the VR system (Taylor-Ritzler et al., 2008).

While the previous literature reviews contribute to the knowledge base about racial/ethnic disparities, there are several limitations. Few of the previous reviews meet the definition of a systematic review (Schlosser, 2007), and only one review has focused on the impact of research published since 1992, a year that coincides with the introduction of several prominent position papers, policies, and scholarly texts on counseling and rehabilitation services for culturally diverse populations (LeBlanc & Smart, 2007). The most notable policy change was Section 21 of the Rehabilitation Act Amendments of 1992 (Public Law 102-569), a mandate that described the need for VR to address racial and ethnic disparities in consumer outcomes (Middleton et al., 1996).

In addition, Sue and colleagues' (1992) call to the counseling profession was a prominent effort to influence services for racial and ethnic minorities. In the same time frame, the National Council on Disability published *Meeting the Unique Needs of Minorities with Disabilities*, a summary of scholarly writing on the need to address diversity and disparities in the rehabilitation field (Wright & Leung, 1993).

Characteristics of Empirical Research on VR Racial Disparities

The following sections and Appendix A categorize and describe findings from 29 empirical research studies on VR disparities. Four categories of research questions emerged from the review, including questions about VR acceptance, services, closure status, and employment outcomes. Several studies posed multiple research questions that spanned across one or more categories, such as research on closure status and quality of employment outcomes (Capella, 2002; Wilson, 1997). Each study used VR administrative data (e.g., RSA 911). Overall, the studies included data from fiscal years 1985–2001, with the exception of 1999. Three studies analyzed multiple years of RSA 911 data or combined years of data to describe trends (Dziekan & Okocha, 1993; Feist-Price, 1995; Staten, 1998). In addition, several researchers selected multiple random samples to examine each unique question (Capella, 2002; Wheaton, Finch, Wilson, & Granello, 1997; Wheaton, Wilson, & Brown, 1996). Nearly half (48.3%) of the studies used data from midwestern states, and 11 studies (38%) analyzed national data. Appendix A summarizes additional details from each study including RSA data sets used, predictor and criterion variables, and main findings.

Several studies included in this review did not report effect sizes (see Appendix B). An effect-size measure was calculated for these studies to facilitate the interpretation of findings (Keith, 2006). Effect size refers to the magnitude of

importance, variance accounted, or practical significance for the primary outcome. Cohen (1988) describes effect sizes (i.e., Cohen's *d*) for experimental or quasi-experimental research as the standardized measured difference between the mean of the treatment and control groups. Cohen and others such as Hedges and Olkin (1985) have also described comparable standardized effect-size measures for common test statistics such as phi or Cramer's V. These authors indicate that effect sizes can be described as small (.2 or less), medium (.4), or large (.6 or greater).

RACE AS A PREDICTOR VARIABLE

In the reviewed studies, race is the primary predictor variable and typically pertains to consumers' self-identification with one of four major racial categories (Black/African American, White/Caucasian, Native American/American Indian, and Asian or Asian Pacific Islander). Although specific terminology for racial groups varies across studies (e.g., White, European American, Caucasian), the intent of most authors was to describe and measure data on race or ethnicity, as reflected in the RSA 911 data set. Nearly 50% of the reviewed studies compared White and Black racial groups only. Many studies excluded data on Asian Americans and American Indians due to small sample sizes. Ethnicity is a separate variable in the RSA 911 (RSA, 2006). As such, Hispanics can self-identify with a race and ethnicity. Seven studies included "Hispanic" as a variable; however, most did not effectively disaggregate race and Hispanic ethnicity (see Appendix A). As such, the authors of these reports potentially measured Hispanics twice. A few studies collapsed racial groups into a dichotomous variable using the labels "majority status" and "minority status" (Dziekan & Okocha, 1993; Staten, 1998).

COMMONLY USED COVARIATES AND CONTROLS

Commonly used control variables included severity of disability, age, gender, and education level. Education level was typically collapsed into three or four categories (e.g., less than high school diploma, high school diploma/certificate, more than high school, college degree). Only one study identified special education status as a variable (Chan et al., 2005). None of the studies discussed findings for transition age youth with disabilities.

Statistical control and range restriction were the two main techniques for controlling variables of interest. Statistical control involves techniques that account for or partial out the influence of factors or spurious correlations of interest on the criterion. Range restriction, on the other hand, typically involves sampling a narrow subgroup (Keith, 2006; Menard, 2002). For example, Wilson (2004) controlled for education by including high school graduates only.

RESEARCH DESIGNS: QUASI-EXPERIMENTAL AND EX POST FACTO

The studies in this review analyzed archival RSA 911 data and can be described as ex post facto; however, 15 studies can be described as quasi-experimental or causal comparative designs (Campbell & Stanley, 1963; Bellini & Rumrill, 1999; Parker & Bolton, 2005). Ex post facto simply means studied or examined after the fact, and it is one of the most commonly used designs in rehabilitation counseling research (Parker & Bolton, 2005). These studies examine correlations or the strength of relationships between variables of interest. Studies that are purely ex post facto typically do not control for extraneous variables (Parker & Bolton, 2005). One limitation of VR racial disparities research using ex post facto designs is that other unmeasured variables outside the scope of data collected could influence or be correlated with predictor or criterion variables (Bellini & Rumrill, 1999; Thomas & Weinrach, 2002a, 2002b).

Conversely, studies using quasi-experimental designs attempt to control for selection bias or other threats to internal validity and as such can provide additional insight and stronger evidence regarding the inferences that can be made between the predictor and criterion variables (Shadish, Cook, & Campbell, 2002; Shavelson & Towne, 2002).

STATISTICAL DESIGNS

Research methods and statistical designs varied; however, most authors used Pearson's chi-square (χ^2) or general linear model techniques (e.g., multiple regression, analysis of variance) to analyze data. Stepwise and hierarchical approaches were the most common forms of regression. Two authors utilized chi-square automatic interaction detection (CHAID), a data-mining technique (Chan et al., 2005; Wilson, 2003). CHAID is amenable to very large sample sizes and useful for exploratory rehabilitation counseling research (Kosciulek, 2004). None of the prior studies utilized structural equation modeling (SEM) approaches, and few utilized factor analysis to develop and test latent constructs. The lack of SEM and latent constructs should not be construed as a criticism of previous research teams, however. The RSA 911 (particularly its older tape forms) can be a challenging data set to manipulate (Walker et al., 1995). Furthermore, many of the statistical software packages, multivariate statistical methodologies, and data-storage strategies that are available today are due to recent advances in computer technology.

VR Acceptance Research

In VR acceptance research, investigators compare rates (e.g., percentages, ratios, proportions) of consumer groups who are found eligible for VR to those found ineligible. Researchers typically test for differences in observed versus expected data or

test the strength of the predictive relationship between racial group status and VR acceptance status, controlling for other variables that might influence VR acceptance.

STUDIES WITH CONFLICTING FINDINGS

Several studies on VR acceptance reported different findings. Capella (2002) used logistic regression and reported that Whites were 1.5 times more likely to be accepted to VR compared to Blacks, controlling for severity of disability. Wilson and associates (2002a), however, reported opposite findings, noting Blacks were 2.12 times more likely to be accepted to VR compared to Whites. Wilson et al. (2002a) also reported that Asian or Asian Pacific Islanders were less likely to be accepted to VR compared to Whites. Conflicting with the aforementioned studies, Wilson (2004) reported that there were no statistically significant differences between Blacks and Whites in VR acceptance. However, Asians were more likely to be accepted than Blacks.

At face value, the discrepancy among these findings is unusual because two of the studies utilized the same 1998 data set (Wilson, 2004; Wilson, Alston, Harley, & Mitchell, 2002a) and two other studies used logistic regression techniques (Capella, 2002; Wilson et al., 2002a). Although logistic regression results can be sample specific, a closer examination reveals that Capella (2002) and Wilson (2004) included severity of disability as a control. Conversely, Wilson et al. (2002a), utilizing a stepwise approach, did not include severity of disability in his logistic regression model. This difference in technique might explain the large odds ratio reported by Wilson et al. (2002a). Many scholars have suggested the benefit of including several covariates, including severity of disability and demographic data, when examining VR outcomes (Bellini & Rumrill, 1999).

NATIONAL VERSUS STATE-LEVEL FINDINGS

Research findings on VR acceptance also varied by geographic region. Several researchers using state-level data reported no statistically significant differences between Blacks and Whites in VR acceptance (Peterson, 1996; Wheaton, 1995; Wilson, 1997, 1999a) whereas two research teams reported higher acceptance rates for Whites (Wilson, 2000; Wilson, Harley, & Alston, 2001). Research by Staten (1998) analyzing state-level data disputed the general trend of these findings. He reported that minorities had higher VR acceptance rates over a multiyear time span.

Unlike the VR acceptance studies using state-level data, all studies using national data sets reported that Whites had higher acceptance rates compared to Blacks (Chan et al., 2005; Wilson, 2002; Wilson, 2003; Wilson & Senices, 2005a). Chan et al. (2005), using 2001 data, also reported that Asian consumers had higher acceptance rates compared to Blacks, Hispanics, and American Indians.

Generally, the VR acceptance studies indicated small effect sizes and measures of practical importance, suggesting that race explained less than 2% of the variance in the acceptance to VR. Cohen (1988) describes effect size measures of .20 or less as small when using phi or Cramer's V test statistics.

VR ACCEPTANCE AND HISPANIC ETHNICITY

Two studies focused on Hispanic ethnicity (Wilson, 2005; Wilson & Senices, 2005a). Both studies reported that Hispanics were accepted to VR at a much higher frequency than non-Hispanics. Wilson and Senices (2005a) reported that Hispanic ethnicity explained a significant portion (nearly 32%) of the variance in VR acceptance; however, the researchers did not control for variables beyond racial status. In addition, Wilson's (2005) study indicated higher VR acceptance rates for Hispanics who self-

identified as White compared to Hispanics who self-identified as Black. Both studies reported that the majority of Hispanics (more than 91%) in VR self-identified as White.

SUMMARY OF VR ACCEPTANCE RESEARCH

The synthesis of VR acceptance research indicates some evidence from national data of higher odds of VR acceptance for Whites and Asian populations compared to other racial groups. These findings concur with Rosenthal et al.'s (2005) meta-analysis on racial variation in VR acceptance that indicated Whites were 1.54 times more likely than Blacks to be accepted to VR. Chan et al.'s (2005) research elaborates on factors influencing VR disparities, noting a greater likelihood for disparities in VR acceptance for culturally diverse groups when the disability is non-severe or relatively ambiguous, such as a learning disability. Although several studies indicated statistical significance, many used extremely large samples, thus limiting the practical significance of the findings. For instance, Wilson (2002) included 162,590 cases in his analysis. Although Wilson (2002) set the *p*-value at a .001, the results were likely significant due to the large sample size.

A different picture emerged from the data on midwestern states. The majority of these studies indicated no racial differences in VR acceptance or greater odds of VR acceptance for Blacks. Indeed, Wilson et al. (2002a) indicated that Blacks were more than twice as likely to achieve VR acceptance compared to Whites. While Wilson's study is compelling, it might be an anomaly or an indicator of success in 1998 for the Michigan VR system. His findings imply that Blacks encountered little, if any, bias in the VR application process. His findings would be more convincing if there were statistical controls for severity of disability in his model.

Wilson's (2005) study on Hispanic ethnicity and VR acceptance has introduced a new line of research on racial disparities. Wilson and associates suggest a phenotype

argument to explain why Hispanics (White) have higher VR acceptance rates. As such, it would be useful to compare Hispanics (Black) to consumers who self-identify as Black (non-Hispanic). If the phenotype argument is valid, this comparison should indicate little or no difference in VR acceptance between groups.

VR Services

Researchers who analyze disparities in VR services typically examine differences in the number, type, costs, or pattern of services. One study in this review examined the relationship between race, patterns of services, and closure status (Wheaton et al., 1997). The majority of studies used state-level data. Only one study analyzed national data (Walker et al., 1995).

COMPARING RESEARCH USING PRE-1992 VERSUS POST-1992 DATA

The findings on racial variation in VR services differ for pre-1992 data compared to post-1992 data (Walker et al., 1995; Wheaton et al., 1997; Wheaton et al., 1996). Walker et al. (1995) used data from 1991 and reported no statistically significant differences in the number of services received between Black and White participants. Walker et al. reported differences in costs of services, however. Asians and Whites had higher expenditures compared to Black and American Indian participants. Cost disparities were most prevalent for racial/ethnic minority consumers with ambiguous disabilities. Walker et al. noted several caveats to the findings, such as the potential influence of time in VR and type of disability on cost of services.

In contrast, Wheaton et al. (1996, 1997) utilized post-1992 data and reported that Blacks received more services than Whites, regardless of closure status (i.e., successful or unsuccessful). In particular, Blacks received more adjustment training, transportation, and maintenance services. Whites received more college training and

restoration services. Unlike Walker et al. (1995), Wheaton et al. did not examine racial variation and costs of services.

RESEARCH ON PATTERNS OF VR SERVICES

Wheaton et al. (1997) was the only study in this review to examine racial variation in patterns of services and subsequent VR outcomes. Using cluster analysis and analysis of variance (ANOVA), Wheaton and colleagues (1997) described five categories or clusters of service patterns: (1) comprehensive services, 2) restoration services, 3) job placement, 4) counseling only, and 5) minimalist. Consumers who received the comprehensive services cluster had more successful VR outcomes. Wheaton et al. also reported that Blacks were more likely to receive one of two extremes in the service patterns (minimalist or comprehensive) and Whites were more likely to receive the counseling intensive service pattern, which consisted of counseling and diagnostic services. The authors reported a small effect size for racial variation (Cramer's V = .18) (Cohen, 1988). Wheaton et al.'s findings do not explain why the specific service clusters were selected for a given consumer or racial group, and no specific theory regarding service patterns was mentioned a priori.

STATE-LEVEL ANALYSES

There were six additional studies that examined state-level data (Feist-Price, 1995; Patterson, Allen, Parnell, Crawford, & Beardall, 2000; Spitznagel & Saxon, 1995; Staten, 1998; Wilson, 1997; Wilson, Turner, & Jackson, 2002b). Most reported findings that were consistent with Wheaton et al. (1996, 1997). For example, Wilson et al. (2002b) reported racial differences in types of services received by Blacks (i.e., more transportation and maintenance services) and Whites (i.e., more college, restoration, and diagnostic services). Spitznagel and Saxon (1995) reported that Asians received more

evaluation services compared to other groups and Asians and American Indians received more business and vocational services. Similar to Walker et al. (1995), two studies posed questions about expenditures and reported that Whites had higher costs of services (Feist-Price, 1995; Patterson et al., 2000). Patterson et al. tested interaction effects and reported that costs of services varied by geographic region within a southeastern state. Whites in some VR service districts had higher expenditures; however, the variance explained for this effect was very small ($R^2 < .01$). Lastly, one study reported no differences in the number of services between minority and majority group consumers (Staten, 1998).

SUMMARY OF VR SERVICES RESEARCH

There were relatively few studies that focused on racial variation in VR services. In addition, the utility of the findings are limited by the age of the data, which are more than 10 years old. Among the few studies in this category, most were quasi-experimental and reported statistically significant relationships between race and patterns of services. The interpretation of these findings is unclear, however. On the one hand, different service patterns by race might indicate systemic bias. On the other hand, it is possible that differences in service patterns were provided based on consumer needs. Furthermore, differences in costs of services might be due to disability type (Walker et al., 1995). Comparing pre-1992 and post-1992 data, there is some evidence that racial variation in number of VR services has changed over time. Post-1992 studies indicate that Blacks received more or an equal number of services. It is reasonable to hypothesize that implementation of Section 21 of the Rehabilitation Act Amendments might have influenced these changes in VR service patterns.

VR Closure Status

VR closure status research typically focuses on outcomes after VR acceptance or predictors of successful closure (i.e., Status 26). A second line of VR closure research focuses on racial differences in reasons for unsuccessful closure, such as "refused services" or "failure to cooperate."

Evidence of Racial and Ethnic Disparities in VR Closure Status

In general, the VR closure status research indicated that Whites were approximately 1.25–1.75 times more likely to be closed Status 26 (i.e., successful employment outcome) compared to Blacks and American Indians, controlling for severity of disability, cost of services, and education level (Capella, 2002; Park, Kim-Rupnow, Stodden, & Starbuck, 2005; Peterson, 1996; Wheaton & Hertzfeld, 2002). In addition, two ex post facto studies (i.e., no control variables) reported similar findings (Feist-Price, 1995; Herbert & Martinez, 1992) and one indicated that Whites fared better than Asians (Park et al., 2005). Two authors noted that American Indian populations were the least likely to attain a successful closure (Capella, 2002; Wheaton & Hertzfeld, 2002). One study tested for interaction effects (Patterson et al., 2000). The authors reported that Whites were closed more successfully in selected VR service districts within a southeastern state.

Alternative Reports: Evidence of No Disparities in VR Closure

Although the majority of studies on VR closure indicated disparities, there were some conflicting findings. Peterson (1996) reported no racial differences in closure status, and Staten (1998), examining the state of Nevada, reported that minorities had higher rates of successful VR closure compared to the majority group. However, Staten's research is limited by threats to its construct validity. Staten collapsed all racial

categories into minority versus majority groups, and it is not readily apparent which racial groups fared better. In addition, one study reported better closure outcomes for Hispanics (Wilson, 2005). Wilson (2005), who disaggregates race and ethnicity, reported that Hispanics (White) were closed successfully more often than Hispanics (Black).

REASONS FOR UNSUCCESSFUL CLOSURE

Several research teams examined racial variation in reasons for unsuccessful closure. Most of these studies reported that Blacks were more likely to be closed in the categories "failure to cooperate" and "unable to locate" (Chan et al., 2005; Feist-Price, 1995; Wilson, 1997; Wilson et al., 1999). Whites were more likely to be closed in the categories "handicap too severe," "no vocational handicap," "other reasons," and "refused services" (Wilson et al., 1999; Feist-Price, 1995; Wilson, 1997).

SUMMARY OF VR CLOSURE RESEARCH

In general, the VR closure studies indicated that Whites (non-Hispanic) were closed in successful categories more often than other racial groups. In addition, the findings indicated that Hispanics who reported their race as White were closed more successfully compared to Hispanics who reported their race as Black. As previously noted, Wilson and colleagues (2005; 2005b) argue that racial variation among Hispanics may be due to phenotype (i.e., skin tone) differences. Phenotype influences the social construction of race and can have a strong influence on perceptions, attitudes, information sharing, and decision making (Alston et al., 2007; Wilson, 2005; Wilson & Senices, 2005b). However, the RSA 911 does not contain variables that might further explain these findings, such as consumers' acculturation, primary language, or skin tone (Wilson, 2005).

The collection of studies examining racial variation and reasons for unsuccessful VR closure were fairly consistent, and few studies explained why Blacks were frequently closed for failure to cooperate. Though speculative, "failure to cooperate" might relate to counseling interaction or interviewing skills, consumers' perception of the VR system (Alston et al., 2007), counselors' cultural competence (Middleton et al., 2000), or a combination of these factors. More in-depth analysis is needed to understand why and how "failure to cooperate" occurs for VR consumers.

VR Employment Outcomes Research

Employment outcomes research typically examined racial and ethnic disparities after successful closure (i.e., Status 26) as opposed to questions about the type of closure status. The studies in this category examined differences in hourly wages, weekly earnings, number of hours worked, and quality of employment.

Research on Earnings and Quality of Employment

Five studies reported that Whites were more likely to be successfully closed with higher weekly earnings when compared to Blacks (Capella, 2002; Feist-Price, 1995; Walker et al., 1995; Wilson, 1997, 1999). In addition, Walker et al. (1995) reported that Asians had higher weekly earnings after successful closure compared to Blacks, Hispanics, and American Indians. Capella (2002) reported that Hispanics had higher quality employment outcomes compared to Whites. More specifically, she noted that Hispanics were 1.77 times more likely to be closed in competitive employment, self-employment, or work in business enterprise. She defined these job environments as integrated settings with a salary equal to or above the minimum wage (RSA, 2006). Herbert and Martinez (1992) also considered quality of employment as an outcome variable. They reported that racial and ethnic minorities were more likely to be closed in

the homemaker category compared to the majority group. Wilson (1999b) reported no differences between Blacks and Whites in weekly hours worked; however, his study did not examine data on quality of employment outcomes, which might elucidate these findings.

PREDICTORS OF EMPLOYMENT OUTCOMES

Two studies used regression techniques to predict employment outcomes for consumers (Peterson, 1996; Staten, 1998). Peterson (1996) reported that White racial status was a statistically significant but weak predictor of competitive employment. Staten reported the three strongest predictors of Status 26 were counseling, job finding, and cost of services. Although these two authors described factors that might predict VR employment outcomes, they appear to violate the assumptions of multiple regression by using dichotomous criterion variables in their equations (Keith, 2006; Menard, 2002). Typically, multiple regression, also known as ordinary least squares (OLS) regression, is used to analyze continuous criterion variables. When the criterion variable is categorical or dichotomous, an alternative multiple regression approach (e.g., logistic or probit regression) is recommended because the use of dichotomous criterion variables can violate assumptions of linearity that are needed for traditional OLS regression (Menard, 2002; Orme & Buehler, 2001). As such, these two studies are susceptible to threats of statistical conclusion validity.

SUMMARY OF VR EMPLOYMENT OUTCOMES RESEARCH

RSA 911 research on racial/ethnic variation and employment outcomes can be difficult to interpret. Although several quasi-experimental studies in this category reported that Whites and Hispanics were closed with higher-quality jobs and higher wages, there are many unmeasured factors outside of the VR system that might

influence employment outcomes. For example, Capella (2002) noted that unemployment rates for Blacks are higher than those for Whites in many areas of the country. Employer attitude or discrimination can also influence employment offers, wages, or consumers' career path (Hernandez et al., 2006). In addition, many people with disabilities face work disincentives, such as the risk of losing valued public benefits. Work disincentives can function as a barrier to accepting or sustaining employment (Stapleton & Burkhauser, 2003; Tremblay, Smith, Xie, & Drake, 2006).

There are at least two schools of thought that can be used to interpret the research findings on racial variation in VR employment outcomes. On the one hand, some scholars argue that the VR program, like many state and federal programs, is not designed or intended to address all social barriers and ills, particularly those far outside its ability to control. Racial and other disparities (e.g., gender) exist in the real world, and consumer outcomes are, in part, a reflection of this reality (Humphreys & Provitt, 1980; Thomas & Weinrach, 2002a). On the other hand, many scholars believe that VR is morally obligated to address known problems that constrain or impact its primary and intended outcome—employment success. For these scholars, VR is a microcosm of larger society and as such factors such as discrimination, bias, and majority culture values are likely to exist within and influence it (Middleton, Rollins, & Harley, 1999; Stodden, Stodden, Kim-Rupnow, Thai, & Galloway, 2003; Whitfield & Lloyd, 2008). Applying the first school of thought, the utility of findings might rest on a consensus regarding the scope of VR accountability. Applying the second position, the findings imply the need for responsive actions to confirm and ameliorate disparities in intermediate and long-term outcomes. Indeed, the recently published VR draft strategic performance plan implies that RSA should consider outside factors in its program monitoring and assessment (RSA, 2008).

Implications for New VR Disparities Research

The literature review suggests many new and contributory ideas for VR disparities research. This dissertation study focuses on racial/ethnic variation in VR employment outcomes and closure status.

MEASURING VR EMPLOYMENT OUTCOMES

Rehabilitation scholars have lamented the poor measurement of employment outcomes in VR research and evaluation (Gilbride et al., 1998; Loprest, 2007). Several authors have suggested that quality of employment outcomes should be measured using multiple indicators such as income, hours worked, satisfaction with employment, career development opportunities, and provision of medical insurance (Cartwright & Kim, 2006; Gilbride et al., 1998). Previous VR racial disparities research, however, has utilized one-dimensional observed variables to assess outcomes (e.g., income or hours worked) (Feist-Price, 1995; Walker et al., 1995; Wilson, 1997, Wilson, 1999b). Two reviewed studies dichotomized quality of employment outcomes (Capella, 2002; Herbert & Martinez, 1992). Capella defined high-quality employment as competitive employment, self-employment, or work in business enterprise program. She defined low-quality employment as unpaid family worker, homemaker, or workshop placement. None of the studies in this review tested or included a latent construct for quality of employment outcomes measured by multiple indicators. To address this issue, a latent construct for Quality of Employment Outcomes (QEO) was developed and tested in this study using confirmatory factor analysis (CFA). The QEO construct was used as an endogenous variable in this study.

RECENT DATA AND SOUTHWESTERN STATES

The studies included in this review utilized older RSA 911 data sets, although more recent data (i.e., 2004–2006) are publicly available for research use. In addition, none of the studies focused on Texas or California, although significant Black and Hispanic populations reside in these states. LeBlanc and Smart's (2007) review of literature also identified gaps in research on western and southwestern states. VR research at the state level is useful for providing a frame of comparison for other states and the nation as a whole. As such, this study utilized RSA 911 data from fiscal year 2006 for Texas. According to the 2006 American Community Survey, the prevalence rates of disability among the non-institutionalized population in Texas by race was 12.4% White, 17.9% Black, and 11.7% for racial groups other than Asian or American Indian. The rate was highest among American Indians at 24.1% (RRTC on Disability Statistics, 2007).

A DIFFERENT APPROACH TO VR CLOSURE RESEARCH

The Rehabilitation Services Administration considers closure status, along with earnings, to be a primary indicator of VR program success (RSA, 2008). RSA is particularly interested in questions about the VR program's impact on consumers who entered VR without employment. The majority of articles on VR closure reviewed for this study examined closure status without considering consumers' employment status at application. Only two of the reviewed studies, both published more than a decade ago, considered work status at referral as a predictor of VR outcomes (Staten, 1998; Wilson, 1997). As such, new research questions were posed for this study regarding racial variation in VR closure status for consumers who were accepted to VR and unemployed at application.

MULTIVARIATE STATISTICAL TECHNIQUES

SEM is a multivariate analysis approach that is increasing in popularity, and it has been recommended and used in counseling research (Weston & Gore, 2006), VR contexts (Chan, Lee, Lee, Kubota, & Allen, 2007; Kosciulek, 2005), and related RSA-sponsored programs such as independent living (Giesen & Cavenaugh, 2006). It has also been recommended for questions regarding VR racial disparities (LeBlanc & Smart, 2007); however, prior studies have not utilized this technique. This dissertation study utilized SEM to develop, test, and compare several conceptual models that implied specific statistical relationships between race/ethnicity, personal history characteristics, and VR outcomes (QEO and closure status). The implied conceptual models were premised on prior research as described in this literature review and the plausible time precedence between exogenous (i.e., predictor) and endogenous (i.e.. criterion) variables (Bolton et al., 2000; Keith, 2006; Saunders, Leahy, McGlynn, & Estrada-Hernández, 2006).

CHAPTER 3

METHOD

The purpose of this study was to test four primary research questions and six sub-questions about the relationship between race/ethnicity, personal history characteristics, and vocational rehabilitation (VR) outcomes (quality of employment and successful closure) for Black, White, and Hispanic participants in the Texas VR system. The relationships of interest include a latent construct for quality of employment outcomes (QEO), were specified a priori, and can be described as implied conceptual models (see Figures 1–3). SEM was used for the analysis of the latent models (Kline, 2005). It integrates multiple regression and confirmatory factor analysis (CFA) and represents a comprehensive strategy for measuring latent constructs and testing research questions about the interrelationship among variables and latent constructs (Hoyle, 1995; Kline, 2005). In addition, traditional regression techniques were used to test sub-questions that did not include latent constructs. SPSS version 16 and Mplus version 5.1 software were used to organize and analyze the data (Muthén & Muthén, 2007; SPSS, Inc., 2008). The RSA 911, fiscal year 2006, was the data source. Wheaton and Kosciulek's (2004) SPSS syntax file was used to convert the raw RSA 911 data.

Research Questions

1.0 Does the implied measurement model for quality of employment outcomes (QEO) fit the observed data for multiple racial and ethnic groups?

1.1 If not, how does the QEO measurement model vary by race/ethnicity?

2.0 Does the structural model regressing QEO on personal history characteristics fit the observed data for multiple racial and ethnic groups?

2.1 If not, how does the structural model vary by race/ethnicity?

3.0 Does the MIMIC model indicate racial/ethnic group differences in QEO?

3.1 How does the regression model with weekly earnings as the endogenous variable compare to the MIMIC model?

3.2 How does the regression model with hourly wages as the endogenous variable compare to the MIMIC model?

4.0 Does the structural model regressing VR closure on personal history characteristics fit the observed data for multiple racial and ethnic groups?

4.1 If not, how does the regression model vary by race/ethnicity?

4.2 Does the regression model indicate racial/ethnic group differences in closure status?

Populations of Interest

There were two populations of interest for this study. The first population consisted of Texas VR consumers who (1) were closed with a successful employment outcome (i.e., Status 26) during the 2006 fiscal year and (2) self-identified as White, Black, or Hispanic. The first population (n = 13,313) was a sub-group of all RSA 911 cases from the Texas VR system (N = 41,252). This population was used to address research questions 1.0–3.2. The distribution by race/ethnicity for the first population of interest was 50.4% White, 20.3% Black, and 29.3% Hispanic. As previously noted, the state of Texas has a large Hispanic population. As such, this distribution differed from the national VR population, which was 63.7% White, 23.2% Black, 8.9% Hispanic, and 4.2% other racial/ethnic groups.

The second population of interest consisted of Texas VR consumers who (1) were accepted for VR services, (2) were unemployed at VR application, and (3) self-identified as White, Black, or Hispanic. Participants were coded as not employed if at VR application they were students or otherwise reported lack of employment (RSA, 2006). Participants were coded as employed if they reported earned employment, supported employment, self-employment, work for a family business, work for a state agency-managed business enterprise program, or homemaker status (RSA, 2006). The second population of interest was a sub-set of all RSA 911 cases from the Texas VR system (N = 41,252). Among all Texas VR cases, 30,192 individuals were accepted for VR services and 21,618 were unemployed at application. Among this group, there were 21,061 cases with no missing values for race/ethnic group status (i.e., White, Black, or Hispanic). The distribution by race/ethnicity was 47.8% White, 26.2% Black, and 26.0% Hispanic. The second population of interest was used to address research questions 4.0–4.2. The distribution for the second population of interest also differed from the national VR population of consumers who were accepted for VR services and unemployed at application, which was approximately 65.5% White, 25.3% Black, and 9.2% Hispanic.

FIRST POPULATION DESCRIPTION

Among White consumers there were more males (53.1%) than females (46.9%). The majority of Whites reported a significant disability (84.5%), and a little more than one quarter (27.1%) received some form of public support (i.e., SSI, SSDI, TANF, veterans' disability benefits, workers' compensation) as defined by the RSA (2006) case-service reporting manual. Among Whites, 64.8% reported a sensory or physical impairment and 35.2% reported a cognitive, psychosocial, or mental impairment. More than 20% of Whites had attained a college degree (associate degree, technical degree, or

higher) prior to VR application, and 6.3% attended special education or received a special education certificate. At time of VR closure, the percentage of Whites with a college degree increased to 27.9%. The data set provided by the RSA in December 2007 did not include or transfer a variable for year of birth. However, data from the 2004 RSA 911 data set indicates that among White working-age adults (ages 16–65), the average VR applicant was 37 years old.

For the Black consumers, there were more females (51.4%) than males (48.6%). The majority reported a significant disability (86.3%), and more than one third (35.6%) received some form of public support. Less than one half (48.2%) reported a sensory or physical impairment; the majority (51.8%) reported a cognitive, psychosocial, or mental impairment. A relatively small percentage (11.4%) of Blacks attained a college degree prior to VR application, and 7.3% attended special education or received a special education certificate. At VR closure, educational attainment of a college degree or higher increased to 16.4%. Data from the 2004 RSA 911 data set suggests that among Black working-age adults (ages 16–65), the average VR applicant was 37 years old.

Among Hispanics, there was a relatively equal gender distribution, 49.4% male and 50.6% female, and the majority reported a significant disability (85.3%). Just more than one quarter of Hispanics (25.3%) received some form of public support. Compared to the other racial groups, a relatively large percentage (71.5%) reported a sensory or physical impairment as a primary disability compared to a cognitive, psychosocial, or mental impairment (28.5%). In terms of education level, 10.2% of Hispanics attained a college degree at application and 6.9% attended special education or received a special education certificate. At VR closure, educational attainment increased as 15% of Hispanics reported a college degree or higher. Data from the 2004 RSA 911 data set

suggests that among Hispanic working-age adults (ages 16–65), the average VR applicant was 34 years old.

RANDOM SAMPLING PROCEDURES

This study utilized a cross-validation sampling approach (Kline, 2005). Two independent random samples were drawn from each population of interest to serve as calibration and validation samples. The random samples for the first population of interest were generated using the following steps:

1. All competitively closed Texas VR cases were identified (n = 13,632). Exactly 319 cases with missing data for race/ethnicity, the primary grouping variable, were removed from the data set.
2. Among the remaining 13,313 cases, 21 cases had missing data for weekly earnings at application (13 missing for Whites, 2 missing for Blacks, and 6 missing for Hispanics). The missing data were replaced with the mean values for weekly earnings by race/ethnicity ($161.57 for Whites, $80.58 for Blacks, and $140.25 for Hispanics).
3. The 13,313 cases were then randomly split into two independent samples for calibration (n_c = 6,617) and validation (n_v = 6,696).
4. Two random samples were drawn from n_c and n_v to conduct the data analysis. Each random sample consisted of 1,200 cases (i.e., Whites n = 400, Blacks n = 400, and Hispanics n = 400).

SECOND POPULATION DESCRIPTION

The second population of interest consisted of consumers who were accepted for VR services and unemployed at time of VR application. Among White consumers there were more males (55.4%) than females (44.6%). The vast majority of Whites (93%)

reported a significant disability, and 40.1% received some form of public support (i.e., SSI, SSDI, TANF, veterans' disability benefits, or workers' compensation). The majority (51.8%) reported a sensory or physical impairment, and 48.2% had a cognitive, psychosocial disability, or other mental impairment. At time of VR application, 15.3% of Whites had attained a college degree (associate degree, technical degree, or higher) and 7.7% attended special education or received a special education certificate. At time of VR closure, educational attainment of a college degree or higher increased to 21.2%.

For the Black consumers, there were more males (52.1%) than females (47.9%). The majority reported a significant disability (93%). Nearly one half (46.5%) received some form of public support. More than one half (57.2%) reported a cognitive or psychosocial disability, and 42.8% reported a physical or sensory disability. For education level, 8.9% of Blacks had attained a college degree at application; 7.4% attended special education or received a special education certificate. At VR closure, educational attainment of a college degree or higher increased to 11.8%.

Among Hispanics, there were more males (55%) than females (45%). The majority reported a significant disability (92.2%), and 40.5% received some form of public support. More than one half (55.6%) reported a sensory or physical impairment, and 44.4% had a cognitive, psychosocial, or other mental impairment. At the time of application to VR, 7% had attained a college degree or higher; 11.2% attended special education or received a special education certificate. At VR closure, educational attainment of a college degree or higher increased to 10.1%.

RANDOM SAMPLING PROCEDURES

The random sampling procedures for the second population of interest were similar to the aforementioned approach. Two independent random samples were drawn

for calibration and validation. The random samples were generated using the following steps:

1. All Texas cases that were accepted for VR services were identified (n = 30,192).
2. Among this population, consumers who were unemployed at application (n = 21,618) were segmented.
3. Exactly 557 cases with missing data for race/ethnicity were removed from the data set.
4. The 21,061 cases with no missing data were randomly split into two independent samples for calibration (n_c = 10,576) and validation (n_v = 10,485).
5. Two random samples were drawn from n_c and n_v to conduct the data analysis. Each random sample consisted of 1,200 cases (i.e., Whites n = 400, Blacks n = 400, and Hispanics n = 400).

Variables

The variables for this study were selected or adapted from the RSA 2006 reporting manual. Three variables (race/ethnicity, education level at application, and public support) were re-coded as described in this section.

EXOGENOUS VARIABLES

Race/ethnicity. Race/ethnicity was a categorical variable (1 = White, 2 = Black, 3 = Hispanic). J-1 dummy coding was used for several analyses with White racial group status as the reference group (Keith, 2006).

Significant disability. Significant disability was a dichotomous variable (0 = no, 1 = yes).

Education level at application. Education level was a nominal variable (0 = less than high school [LTHS], 1 = high school diploma or certificate [HS], 2 = more than high school [MTHS], 3 = associate or technical degree, 4 = bachelor's degree or higher). Questions 2.0 and 2.1 included a binary variable for education level (less than bachelor's degree = 0, bachelor's degree or higher = 1). Question 3.0 included J-1 dummy coding for education level with LTHS as the reference group.

Gender. Gender was a dichotomous variable (0 = male, 1 = female).

Weekly earnings at application. Weekly earnings at time of VR application was a continuous variable for dollar amount received for work.

Public support. Public support was defined as receipt of any governmental program funding to support independent living or disability (0 = no, 1 = yes). Respondents who received any form of governmental program funding at time of VR application (i.e., SSI, SSDI, General Assistance, veterans' disability benefits, TANF, workers' compensation, or other public support) were coded as receiving public support. VR participants who responded "no" to all forms of public support were coded as no.

ENDOGENOUS VARIABLES

Closure status. Closure status was a dichotomous variable (0 = unsuccessful, 1= successful). Consumers who were accepted to VR and closed in Status 26 were coded as successful. Consumers who were accepted but closed without an employment outcome were coded as unsuccessful.

Quality of Employment Outcomes (QEO). QEO was defined by three observed indicator variables. For the QEO construct, (1) higher earnings, (2) medical insurance provided through employment, and (3) higher hourly wages were equated with an increase in QEO.

Weekly earnings at close. Weekly earnings at time of VR closure was a continuous variable for dollar amount received for work.

Medical insurance provided through employment. Medical insurance provided was a dichotomous variable (0 = no, 1 = yes).

Hourly wages at close. Hourly wages at time of VR closure was a continuous variable.

VARIABLE TRANSFORMATIONS

Three income variables in this study were non-normally distributed and required transformation to conduct the analysis. The skewed variables were weekly earnings at application (skew = 2.72, SE = .021), weekly earnings at closure (skew = 2.66, SE = .021), and hourly wages at closure (skew = 31.84, SE = .021). Data for these variables were windsorized at 90% and transformed using natural logarithm prior to data analysis. Windsorizing data is a statistical technique for trimming outliers and reducing non-normal patterns. It consists of replacing data at a designated point in both tails of the data series (e.g., 5th and 95th percentile) with the highest value in the data series (Thompson, 2006). Windsorizing is a useful approach as it deletes extreme values without deleting cases. The income variables were windsorized at the population level prior to the random sampling procedures. Table 2 indicates the original and windsorized values in dollars for the income variables in the population (n = 13,313).

Although windsorizing the data helped address outliers and extreme values, the data remained non-normal. As such, the natural logarithm was applied prior to data analysis. The natural log can be used as a statistical technique for transforming skewed data patterns into a normal distribution while maintaining the same relative order of data prior to the transformation (Kline, 2005; Osborne, 2002). In addition, all zero

values for weekly earnings at application were re-coded to one dollar ($1.00) in order to apply the natural log function, which requires a value greater than zero (Osborne, 2002).

Table 2. Comparison of Unadjusted and Windsorized Income Data for VR Consumers

	Weekly earnings at application		Weekly earnings at closure		Hourly wages at closure	
	U	W	U	W	U	W
Minimum	1.00	1.00	6.00	103.00	5.15	5.25
Maximum	2,695.00	597.30	3,250.00	777.30	570.50	20.00
Mean	138.88	126.67	357.86	344.90	10.28	9.83

Note. All values measured in dollars. U = unadjusted original value; W = 90% windsorized value.

Structural Equation Modeling Procedures

This section explains the global procedures used in the structural equation modeling (SEM) analyses for this study. In general, the below six procedural steps were followed, based on the SEM literature (Kline, 2005; Weston & Gore, 2006):

1. Model specification
2. Model identification
3. Sample size calculation and data screening
4. Model estimation
5. Model evaluation and re-specification
6. Cross-validation

MODEL SPECIFICATION

SEM is primarily an a priori technique. As such, the proposed conceptual models for the relationships and variables of interest were specified in advance (Kline, 2005). For example, Figure 1, which can be described as a measurement model,

specifies in advance the overall conceptual model that was tested for research questions 1.0 and 1.1. Of particular importance is the fact that Figure 1 implies a specific variance/covariance relationship for the conceptual model. This implied statistical relationship was hypothesized to exist in the observed data for the Texas VR system (Kline, 2006; Kaplan, 1995). SEM analysis utilizes a discrepancy function to compare the implied variance/covariance relationships to the observed relationships in the sample data (Kaplan, 1995). If the implied variance/covariance matrix is equivalent (i.e., small residual difference) to the observed, then the implied model can be described as a "good fit" and it is more plausible that the implied model is a good representation of the observed sample (Kline, 2005).

MODEL IDENTIFICATION

The model identification step determines whether a unique estimate can be derived for the conceptual model specified. A unique model estimate can be derived when there are more parameters requiring estimation than observations in the model specified (Kline, 2005). In general, parameters that require estimation include all exogenous variables, error variances, direct paths, and covariance paths. The number of observations in a model can be calculated by adding the number of unduplicated variances and covariances or using the formula $p\,(p+1)\,/\,2$, where p = observed variables (Hoyle, 1995; Kline, 2005). The difference between the number of observations in the specified model and the number of parameters needing estimation equals the degrees of freedom (*df*) for the specified model. Degrees of freedom are necessary to derive a unique estimate. Models with more observations than paths to estimate (i.e., $df > 0$) are known as over-identified models. Over-identified models permit the testing of hypotheses and research questions about implied measurement and structural relationships because there are one or more unknown parameters that can be

estimated. Model identification is an important procedural step because over-identified models are preferred for SEM analysis (Kline, 2005). In contrast, there are two other model identification results that are typically avoided (Kline, 2005). Models that have an equal number of observations and paths to estimate ($df = 0$) are described as just-identified models. In other words, there is only one solution. Models with more paths to estimate than available observations are described as under-identified ($df < 0$). Under-identified models cannot be estimated because there are an insufficient number of observations (Kline, 2005).

SAMPLE SIZE CALCULATION

There is no consensus within the SEM literature on the best sample size or sample size calculation approach; however, there are recommendations for determining an appropriate sample size (Chan et al., 2007; Jackson, 2003; Kline, 2005; Raykov & Widaman, 1995). Kline (2005) recommends using 10–20 cases per parameter to estimate and describes 200 cases as a medium sample size. Jackson (2003) suggests that sample size should be considered in light of the normality of the data, the number of observations to estimate, and the estimation method. Jackson also recommends a 20:1 ratio of sample size to parameters to be estimated. Numerous Monte Carlo studies, which utilize simulated data, have also suggested that sample sizes of $n = 200$ provide adequate power for SEM studies (Tanaka, 1987). Many SEM scholars recommend using larger sample sizes when data are non-normal, however (Kline, 2005; Raykov & Widaman, 1995; Tanaka, 1987). Generally, larger sample sizes and degrees of freedom yield higher power for SEM analysis (Keith, 2006; McQuitty, 2004). A sample size of $n = 400$ per group (i.e., equal sample sizes) was selected for this study based on the SEM literature and recommendations for analyzing non-normal data. Thompson and Green

(2006) have recommended using equal sample sizes when multiple-group SEM analyses are conducted.

MODEL ESTIMATION

Model estimation, that is to conduct the analysis, is a complex calculation that can be facilitated by computer software programs such as Mplus, AMOS, or LISREL (Kline, 2005; Muthén & Muthén, 2007). Model estimation approaches, also known as model estimators, are determined by considering the model's specification, variable types (e.g., continuous, nominal, categorical), and normality of the data. The most common model estimator is maximum likelihood (ML). ML estimation is based on a normal distribution theory and is designed to analyze and estimate all paths in the conceptual model to maximize the likelihood that they come from the observed population (Kline, 2005). In other words, during the estimation process, the implied statistical relationships, which are reflected in the model specification, are tested using the observed data. For an over-identified conceptual model, it is unlikely the observed data will be an exact fit for the implied statistical relationships. Thus, a main goal of estimation is deriving the closest-fitting statistical solution that can be determined. The closest-fitting solution can be described in terms of *goodness of model fit* (i.e., good fit versus poor fit) (Kline, 2005).

The ML estimation approach, as described above, is relatively robust. However, other estimation approaches, such as weighted least squares (WLS) and weighted least squares mean and variance adjusted (WLSMV), are recommended when data are categorical or non-normal (Kline, 2005). WLS techniques address non-normality by considering the skewness and kurtosis of data (Muthén & Muthén, 2007). Mplus, the program used in this study, is particularly useful for model estimation because it

includes a range of estimators for analyzing non-normal data patterns (Muthén & Muthén, 2007).

Model Evaluation

Models are evaluated after the estimation process. Evaluation consists of assessment of the model fit, path coefficients, and standard errors (Kline, 2005). There are several model-fit indices for SEM. The most commonly used fit index is the chi-square test of model fit; however, it can be sensitive to large sample sizes (Kline, 2005). Other recommended fit indices include the Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), and Weighted Root Mean Square Residual (WRMR) (Kline, 2005; Muthén & Muthén, 2007). These model fit indices consider additional aspects of the SEM analysis, such as sample size, model complexity, number of parameters, and degrees of freedom (Fan, Thompson, & Wang, 1999; Hu & Bentler, 1999; Kline, 2005; Tanaka, 1987). The WRMR is preferred to the SRMR when using WLS estimators (Yu, 2002). Most scholars recommend using several indices or joint fit standards because model fit indices vary in calculation and approach. Furthermore, using multiple indices can help reduce the risk of discarding a good fitting model or retaining a poor fitting model (Hu & Bentler, 1999; Kline, 2005; Raykov & Widaman, 1995). As such, several model fit indices were used in this study to evaluate the models (see Table 3). SEM evaluation also considers the magnitude and direction of path coefficients and factor loadings (Raykov & Widaman, 1995). These parameters were evaluated by dividing the parameter estimate by its standard error, a common approach that yields a *z*-value for determining statistical significance (Muthén & Muthén, 2007).

Table 3. Model Fit Indices and Recommended Values for SEM Analysis

Model Fit Index	Recommended Values
Chi-square *p* value	> .05
CFI	≥ .95
RMSEA	≤ .06
WRMR	≤ 1.0

MODEL REFINEMENT AND RESPECIFICATION

Though SEM is an a priori strategy, more often than not, implied conceptual models will require respecification (i.e., refinement) to achieve good fit (Kline, 2005). Thus, SEM is also exploratory; however, respecification should be guided by a conceptual or empirically grounded rationale. Respecification typically involves the process of model building or trimming. Model building involves adding paths to the specified model in a meaningful or theoretically plausible manner (Kline, 2005). Model building is guided by existing empirical literature and the Lagrange Multiplier test, which is used to calculate modifications that are statistically significant. Using Lagrange Multiplier tests to add plausible paths or release model constraints can improve overall model fit; however, model building can decrease parsimony (Kline, 2005). Conversely, model trimming refers to eliminating one or more nonsignificant paths from the specified model to improve model parsimony while simultaneously attempting to maintain a good model fit. Model trimming is guided by assessing the Wald statistic, which indicates paths that can be removed without harming model fit (Kline, 2005).

CROSS-VALIDATION

Cross-validation refers to retesting a final conceptual model on a second independent random sample from the same population. Cross-validation is a useful and

recommended procedure because model development can involve multiple statistical tests and refinement on the calibration sample (Kline, 2005). Cross-validation can also reduce the risk of fishing and error rate problems (Parker & Szymanski, 1992; Raykov & Widaman, 1995). Evidence of similar findings across samples can help substantiate the stability of research results.

Data Analysis

RESEARCH QUESTION 1.0

1.0 Does the implied measurement model for quality of employment outcomes (QEO) fit the observed data for multiple racial and ethnic groups?

1.1 If not, how does the QEO measurement model vary by race/ethnicity?

Purpose. The purpose of questions 1.0 and 1.1 was to determine the measurement model for QEO and to establish the adequacy of the latent construct for SEM analysis.

Methods. The global SEM procedures previously described were used for this question. Confirmatory factor analysis (CFA) was conducted to test and examine the QEO measurement model. CFA models consist of multiple indicators that co-vary and contribute to the measurement of a latent variable (Kline, 2005). The QEO measurement model, as specified in Figure 1, can be described as over-identified as there are three observed variables and five components to estimate. Using the formula for calculating the model observations indicates six observations and one degree of freedom. An indicator path and all error paths are set to a value of one in order to estimate the model. Multiple group equality constraints were imposed to test for measurement invariance. Evidence of measurement invariance indicates equivalent models (Kline, 2005). For all SEM models in this study, the value of one was used to

set parameter or coefficient weights when there was no inherent value for the parameter (Kline, 2005). For example, the residual path coefficient for the direct effect of the measurement errors was set to one.

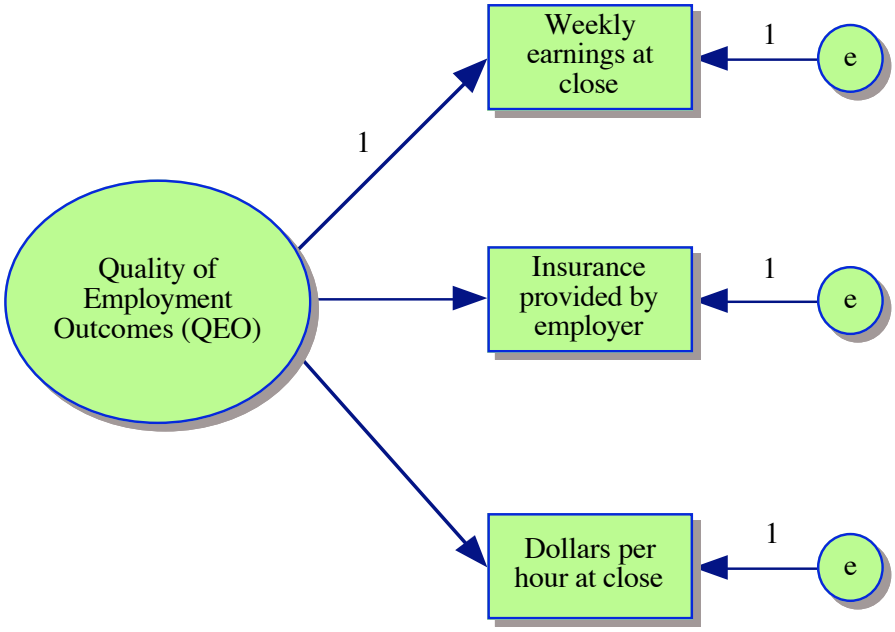


Figure 1. Implied Measurement Model for Quality of Employment Outcomes (QEO)

Data analysis. The procedures for CFA included model estimation, model fitting, and evaluation. In addition, the CFA analysis included an assessment of path loadings, variance extracted, and construct reliability (Hancock & Mueller, 2001; Kline, 2005). Multiple group comparison tests were conducted to determine if the QEO construct operated in a similar manner across racial/ethnic groups. According to L. Muthén (personal communication, September 2, 2008), the WLSMV estimator is appropriate for this latent construct analysis. WLSMV is a weighted least squares estimation approach that uses a mean and variance adjusted chi-square. As such, the traditional chi-square and degrees of freedom are not applicable in WLSMV. The

salient fit index when using WLSMV is the chi-square *p*-value, similar to maximum likelihood (ML) and other normalized data estimation approaches.

RESEARCH QUESTION 2.0

2.0 Does the structural model regressing QEO on personal history characteristics fit the observed data for multiple racial and ethnic groups?

2.1 If not, how does the structural model vary by race/ethnicity?

Purpose. Question 2.0 was intended to test and examine the implied structural model for the relationship between personal history characteristics and the latent construct (QEO) for each racial/ethnic group (see Figure 2).

Methods. The global SEM procedures previously described were used for this question. As Figure 2 indicates, the model is over-identified with 8 observed variables and 26 components to estimate. Using the formula for model observations $p\ (p+1)\ /\ 2$, there were 36 observations and 10 degrees of freedom. The QEO factor is an endogenous variable in this model. Disturbance and error paths are set to a value of one in order to establish a scale.

Data analysis. Data analysis was similar to the previously described SEM procedures. WLSMV estimation was used for the analysis. Multiple group equality constraints were imposed to examine the invariance of the model. Standardized estimates were reported for the continuous exogenous variable (weekly earnings at application). Modified standardized estimates, also known as STDY, were reported for the categorical exogenous variables to interpret the binary scales. Modified standardized estimates were calculated by dividing the standardized estimate (STDYX) by the standard deviation of the exogenous variable (i.e., SD of x) (Muthén & Muthén, 2007).

Question 2.1 was intended to investigate racial variation in the structural model and the relative influence for specific path coefficients.

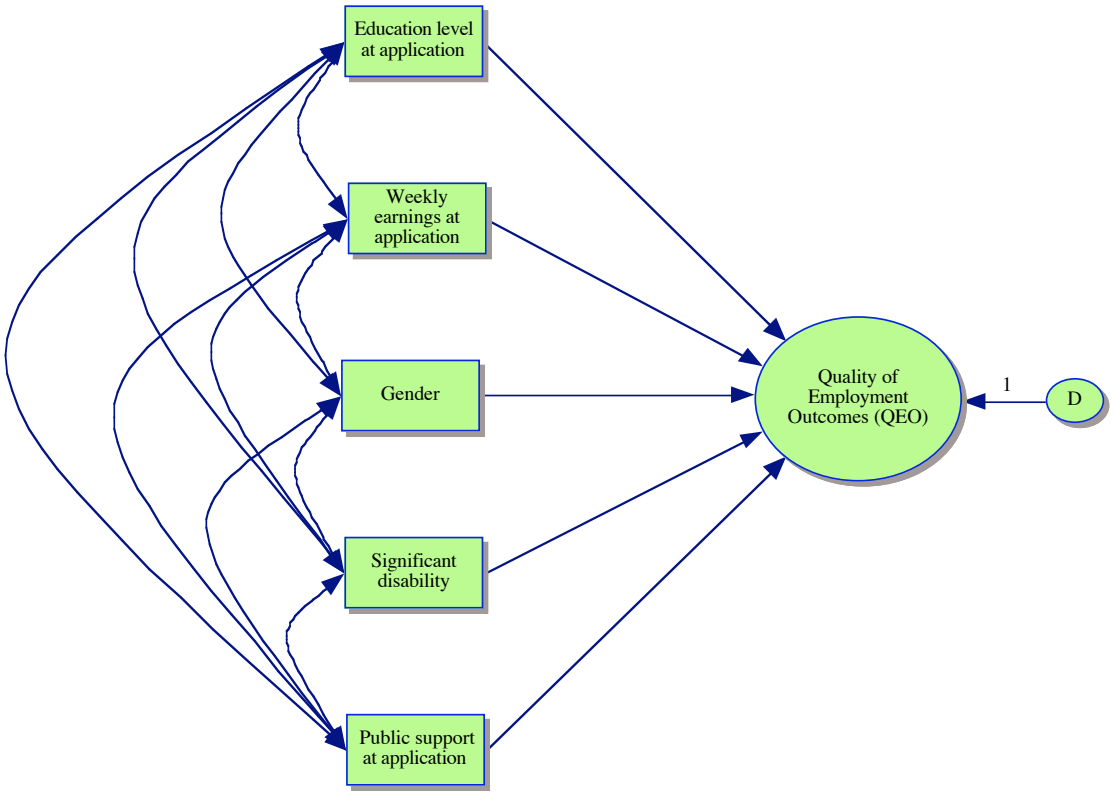


Figure 2. Implied Structural Model for the Relationship Between Personal History Characteristics and QEO for VR Consumers (White, Black, and Hispanic)

RESEARCH QUESTION 3.0

3.0 Does the MIMIC model indicate racial/ethnic group differences in QEO?

3.1 How does the regression model with weekly earnings as the endogenous variable compare to the MIMIC model?

3.2 How does the regression model with hourly wages as the endogenous variable compare to the MIMIC model?

Purpose. The purpose of question 3.0 was to examine racial/ethnic variation in QEO. The MIMIC approach is the recommended data analysis strategy when there is measurement invariance (Thompson & Green, 2006). The MIMIC approach was

compared to two sub-questions (3.1 and 3.2), which tested for racial variation associated with one-dimensional endogenous variables (weekly earnings and hourly wages).

Methods. In each model, the race/ethnicity variable was dummy coded and used to estimate the path coefficient to the endogenous variable. Figure 3 illustrates the implied structural model for research question 3.0. The model was over-identified with 45 observations, 28 components to estimate, and 17 degrees of freedom.

Data analysis. SEM procedures were used for research question 3.0. Similar to the previous research question, modified standardized estimates (STDY) were calculated and reported for the categorical exogenous variable in order to interpret the binary scales (Muthén & Muthén, 2007). Questions 3.1 and 3.2 were conducted using traditional linear regression techniques. A stepwise approach was used to examine the change in R^2 for race/ethnicity.

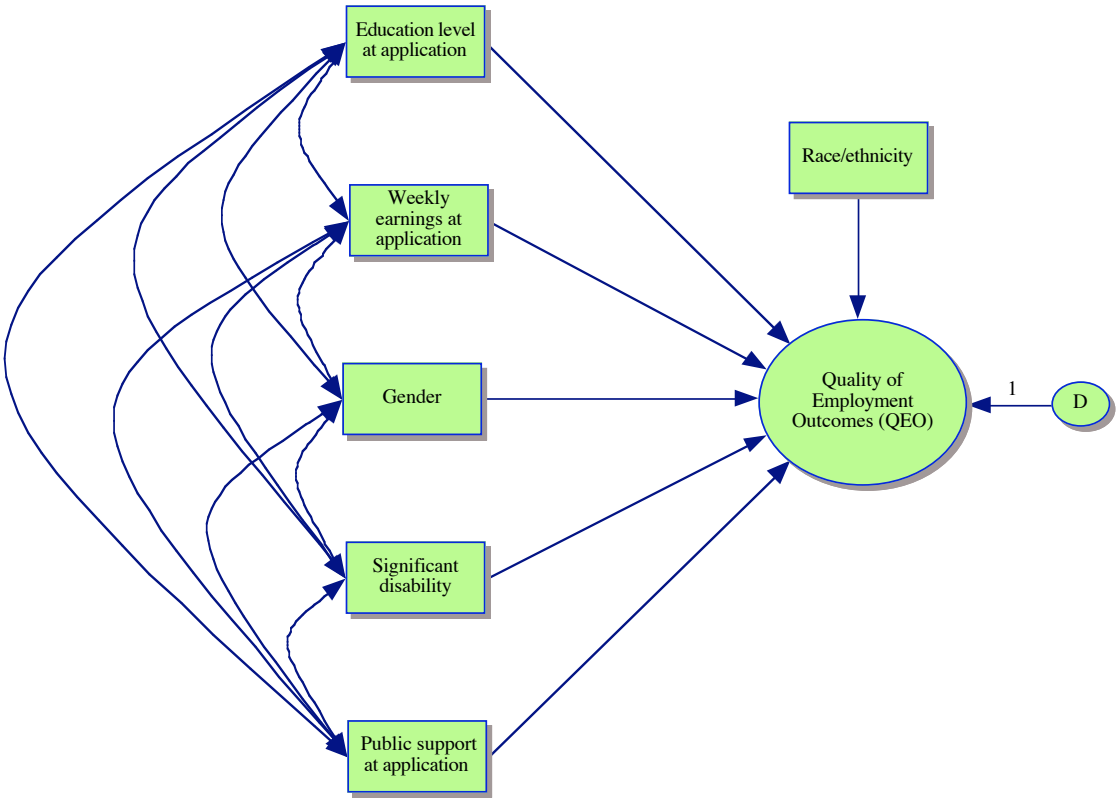


Figure 3. Implied MIMIC Model for the Influence of Race/Ethnicity on QEO

RESEARCH QUESTION 4.0

4.0 Does the structural model regressing VR closure on personal history characteristics fit the observed data for multiple racial and ethnic groups?

4.1 If not, how does the regression model vary by race/ethnicity?

4.2 Does the regression model indicate racial/ethnic group differences in closure status?

Purpose. The purpose of question 4.0 was to examine VR closure for consumers who were unemployed at VR application. Question 4.0 tested an implied path model with three personal history characteristics (public support, education level, and gender) and VR closure (see Figure 4). Questions 4.1 and 4.2 examined predictors of VR closure status.

Methods. Data were used from the second population of interest. Path analysis, a basic form of structural equation modeling, was used to assess the implied model for question 4.0 (Keith, 2006; Kline, 2005). Multiple group equality constraints were imposed to assess group differences in the structural model. Logistic regression was used for questions 4.1 and 4.2.

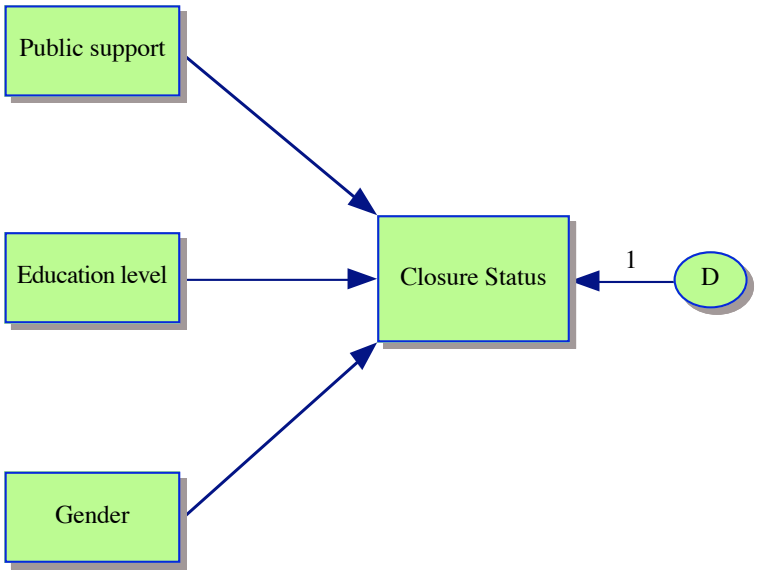


Figure 4. Implied Path Model for the Relationship Between Personal History Characteristics and VR Closure Status for White, Black, and Hispanic Consumers

CHAPTER 4

RESULTS

The purpose of this study was to test four primary questions and six sub-questions about implied conceptual models for the relationship between race/ethnicity, personal history characteristics, and VR outcomes. This study utilized 2006 RSA 911 data from Texas. Cross-validation sampling techniques were used to assess the stability of the study results. The following questions were addressed:

1.0 Does the implied measurement model for quality of employment outcomes (QEO) fit the observed data for multiple racial and ethnic groups?

1.1 If not, how does the QEO measurement model vary by race/ethnicity?

2.0 Does the structural model regressing QEO on personal history characteristics fit the observed data for multiple racial and ethnic groups?

2.1 If not, how does the structural model vary by race/ethnicity?

3.0 Does the MIMIC model indicate racial/ethnic group differences in QEO?

3.1 How does the regression model with weekly earnings as the endogenous variable compare to the MIMIC model?

3.2 How does the regression model with hourly wages as the endogenous variable compare to the MIMIC model?

4.0 Does the structural model regressing VR closure on personal history characteristics fit the observed data for multiple racial and ethnic groups?

4.1 If not, how does the regression model vary by race/ethnicity?

4.2 Does the regression model indicate racial/ethnic group differences in closure status?

The study results are presented in this chapter in two parts. The first part summarizes the descriptive statistics and the correlation matrix for each racial/ethnic group in the calibration samples. The second part presents the findings for each research question.

Descriptive Statistics

The calibration sample for questions 1.0–3.3 was drawn from the first population of interest, which consisted of VR consumers who (1) were closed with a successful employment outcome (i.e., Status 26) during the 2006 fiscal year and (2) self-identified as White, Black, or Hispanic.

DEMOGRAPHICS CHARACTERISTICS

For the White participants, there were slightly more females (52%) than males (48%). The majority reported a significant disability (84.8%), and just more than one quarter of Whites (26.0%) received some form of public support (i.e., SSI, SSDI, TANF, veterans' disability benefits, or workers' compensation) (RSA, 2006). More than one half (65.5%) had a sensory or physical impairment, and 34.5% reported a cognitive, psychosocial, or other mental impairment. One fifth (21.5%) had a college degree at time of VR application (i.e., associate degree, technical degree, or higher), and 6.8% attended special education or received a special education certificate. At VR closure, 28% of Whites attained a college degree. As previously discussed, income data were non-normal and windsorized at 90%. After windsorizing the data, Whites in the calibration sample reported mean weekly earnings of $150.21 at application, $384.78 in mean weekly earnings at closure, and $10.71 in mean hourly wages at closure. Tables 4 and 5 provide additional summary statistics for the calibration sample organized by race/ethnicity and gender.

For the Black participants, the gender distribution was relatively equal (50.5% female, 49.5% male). The majority reported a significant disability (87.8%), and just

more than one third of Blacks (33.8%) received some form of public support. Less than half (46.5%) had a sensory or physical impairment; the majority (53.5%) reported a cognitive, psychosocial, or other mental impairment. At time of VR application, 13.0% of Blacks had attained a college degree and 8.5% attended special education or received a special education certificate. At VR closure, 18.7% held a college degree. After windsorizing the non-normal income data at the population level, Blacks in the calibration sample reported mean weekly earnings of $80.96 at application, $334.14 in mean weekly earnings at closure, and $9.50 in mean hourly wages at closure.

Among Hispanics, there were slightly more males (51.0%) than females (49.0%). The majority reported a significant disability (87.8%), and a relatively small percentage (22.0%) received public support. More than two thirds (70.5%) reported a sensory or physical impairment, and 29.5% had a cognitive, psychosocial, or mental impairment. For education level, 14.3% of Hispanics had a college degree at VR application and 7.2% attended special education or received a special education certificate. At time of VR closure, 16.4% held a college degree. After windsorizing the income data, Hispanics in the calibration sample reported mean weekly earnings of $135.81 at application, $310.60 in mean weekly earnings at closure, and $8.92 in mean hourly wages at closure.

Table 4. Descriptive Statistics by Race and Gender for Competitively Closed VR Consumers (Calibration Sample)

	Race/Ethnicity					
	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
	192 (48.0)	208 (52.0)	198 (49.5)	202 (50.5)	204 (51.0)	196 (49.0)
Significant disability						
No	30 (15.6)	31 (14.9)	25 (12.6)	24 (11.9)	23 (11.3)	26 (13.3)
Yes	162 (84.4)	177 (85.1)	173 (87.4)	178 (88.1)	181 (88.7)	170 (86.7)
Public support						
No	141 (73.4)	155 (74.5)	140 (70.7)	125 (61.9)	159 (77.9)	153 (78.1)
Yes	51 (26.6)	53 (25.5)	58 (29.3)	77 (38.1)	45 (22.1)	43 (21.9)
Education at application						
LTHS	43 (22.4)	34 (16.3)	62 (31.3)	55 (27.2)	91 (44.6)	72 (36.7)
HS diploma	64 (33.3)	82 (39.4)	88 (44.4)	78 (38.6)	73 (35.8)	72 (36.7)
More than high school diploma	43 (22.4)	48 (23.1)	26 (13.1)	39 (19.3)	16 (7.8)	19 (9.7)
Associate or technical degree	16 (8.3)	24 (11.5)	16 (8.1)	20 (9.9)	13 (6.4)	22 (11.2)
Bachelor's degree or higher	26 (13.5)	20 (9.6)	6 (3.0)	10 (5.0)	11 (5.4)	11 (5.6)
Medical insurance through employment						
No	153 (79.7)	173 (83.2)	175 (88.4)	171 (84.7)	176 (86.3)	166 (84.7)
Yes	39 (20.3)	35 (16.8)	23 (11.6)	31 (15.3)	28 (13.7)	30 (15.3)

Note. Number and (percentage) provided. Sample size (n = 400) the same for each racial/ethnic group. LTHS = less than high school diploma.

Table 5. Earnings and Hourly Wages by Race and Gender for Competitively Closed VR Consumers (Calibration Sample)

	Race/Ethnicity					
	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
Weekly earnings at application	150.96 (215.16)	149.51 (187.18)	63.22 (136.79)	98.34 (164.86)	140.44 (191.36)	130.99 (159.81)
Weekly earnings at close	421.61 (220.33)	350.78 (179.51)	344.64 (164.40)	323.85 (167.22)	337.23 (175.50)	282.87 (151.93)
Hourly wage at close	11.30 (4.77)	10.17 (4.20)	9.65 (3.55)	9.35 (3.67)	9.32 (3.96)	8.51 (3.37)

Note. Mean and (standard deviation) provided. Values in dollars. Sample size (n = 400) the same for each racial/ethnic group.

CORRELATION MATRICES WITH VARIANCES ALONG THE DIAGONAL (CALIBRATION)

Table 6. Correlation Matrix With Variances for Competitively Closed VR Consumers (Whites *n* = 400)

Variables	1	2	3	4	5	6	7	8
1. Gender	.250							
2. Significant disability	.010	.129						
3. Public support	-.012	.109	.192					
4. Education at application	.006	-.026	-.034	1.519				
5. Weekly earnings at application	.065	-.216	-.240	.213	8.017			
6. Weekly earnings at closure	-.136	-.103	-.208	.230	.169	.328		
7. Insurance provided by employer	-.065	-.067	-.311	.163	-.299	.418	.151	
8. Hourly wages at closure	-.113	-.054	-.129	.273	.153	.836	.339	.164
Mean	.520	.850	.260	1.58	2.55	5.80	.190	2.29

Table 7. Correlation Matrix With Variances for Competitively Closed VR Consumers (Blacks *n* = 400)

Variables	1	2	3	4	5	6	7	8
1. Gender	.250							
2. Significant disability	.011	.107						
3. Public support	.093	.105	.224					
4. Education at application	.092	.017	.055	1.146				
5. Weekly earnings at application	.151	-.138	-.216	.106	6.178			
6. Weekly earnings at closure	-.066	-.059	-.244	.324	.092	.269		
7. Insurance provided by employer	.086	-.132	-.107	.223	.364	.471	.117	
8. Hourly wages at closure	-.049	.028	-.162	.343	.087	.841	.370	.127
Mean	.500	.880	.337	1.17	1.57	5.68	.130	2.18

Table 8. Correlation Matrix With Variances for Competitively Closed VR Consumers (Hispanics $n = 400$)

Variables	1	2	3	4	5	6	7	8
1. Gender	.250							
2. Significant disability	-.030	.107						
3. Public support	-.001	-.004	.172					
4. Education at application	.087	.013	-.067	1.340				
5. Weekly earnings at application	.073	-.161	-.186	.068	7.719			
6. Weekly earnings at closure	-.171	-.102	-.157	.237	.136	.267		
7. Insurance provided by employer	.035	-.140	-.108	.255	.393	.438	.124	
8. Hourly wages at closure	-.105	-.059	-.009	.339	.100	.770	.338	.125
Mean	.490	.880	.220	1.02	2.58	5.61	.140	2.12

Second Population: Calibration Sample

The calibration sample for research questions 4.0–4.2 was drawn from the second population of interest, which included consumers who (1) were accepted for VR services, (2) were unemployed at application to VR, and (3) self-identified as White, Black, or Hispanic. Random sampling procedures were used to generate the calibration and validation samples, as described in chapter 3. The following sections provide descriptive statistics by race/ethnicity.

DEMOGRAPHIC CHARACTERISTICS

Among White consumers there were more males (54.5%) than females (45.5%). The vast majority of Whites (90.8%) reported a significant disability, and 44% received some form of public support (i.e., SSI, SSDI, TANF, veterans' disability benefits, or workers' compensation). More than one half (55.8%) had a sensory or physical impairment, and 44.2% reported a cognitive, psychosocial, or other mental impairment. At time of VR application, 17.2% of Whites had attained a college degree or higher and 6% attended special education or received a special education certificate. At time of VR closure, educational attainment (college degree or higher) increased to 21.3%. White females had higher education levels at application to VR compared to other racial/ethnic groups. More than one third (36.5%) of Whites in the calibration sample were closed with an employment outcome. Among White consumers who were closed without an employment outcome, the most frequent reasons for unsuccessful closure were "failure to cooperate" (14.5%) and "unable to locate" (11%).

Among Black consumers, there were more males (56.8%) than females (43.3%). More than 91% reported a significant disability, and nearly one half (46.8%) received some form of public support. Unlike the other racial/ethnic groups, nearly two thirds

(62.3%) reported a cognitive, psychosocial, or other mental impairment; 37.7% reported a physical or sensory impairment. For education level, 8.3% had attained a college degree or higher at time of VR application and 8% attended special education or received a special education certificate. At time of VR closure, educational attainment (college degree or higher) increased to 11.7%. More than one third (35.8%) of Blacks were closed with an employment outcome. Similar to the White and Hispanic groups, the most frequent reasons for unsuccessful closure were "failure to cooperate" (23%) and "unable to locate" (14.4%).

Among Hispanic consumers, there were more males (53%) than females (47%). More than 90% reported a significant disability, and more than one third (38.3%) received some form of public support. Similar to the White group, more than one half (54.5%) of Hispanics had a sensory or physical impairment, and 45.4% reported a cognitive, psychosocial, or mental impairment. At time of VR application, 7.3% of Hispanics had attained a college degree or higher and 11.5% attended special education or received a special education certificate. At time of VR closure, educational attainment (college degree or higher) increased to 11.5%. Compared to the other racial groups, Hispanics reported the highest rate of successful closure (40.3%). Among unsuccessful closures, the most frequent reasons were "failure to cooperate" (18%) and "unable to locate" (12.5%).

Table 9. Descriptive Statistics for VR Consumers Unemployed at Application by Race and Gender (Calibration Sample)

	Race/Ethnicity					
	White		Black		Hispanic	
	Male	Female	Male	Female	Male	Female
	218 (54.5)	182 (45.5)	227 (56.8)	173 (43.2)	212 (53.0)	188 (47.0)
Significant disability						
No	17 (7.8)	20 (11.0)	12 (5.3)	17 (9.8)	19 (9.0)	17 (9.0)
Yes	201(92.2)	162 (89.0)	215 (94.7)	156 (90.2)	293 (91.0)	171 (91.0)
Public support						
No	117 (53.7)	107 (58.8)	132 (58.1)	81 (46.8)	129 (60.8)	118 (62.8)
Yes	101 (46.3)	75 (41.2)	95 (41.9)	92 (53.2)	83 (39.2)	70 (37.2)
Education level						
LTHS	52 (23.9)	40 (22.0)	80 (35.2)	52 (30.1)	100 (47.2)	90 (47.9)
HS diploma	92 (42.2)	64 (35.2)	93 (41.0)	72 (41.6)	84 (39.6)	60 (31.9)
More than high school diploma	44 (20.2)	39 (21.4)	35 (15.4)	35 (20.2)	17 (8.0)	20 (10.6)
Associate or technical degree	17 (7.8)	23 (12.6)	14 (6.2)	10 (5.8)	9 (4.2)	9 (4.8)
Bachelor's degree or higher	13 (6.0)	16 (8.8)	5 (2.2)	4 (2.3)	2 (.9)	9 (4.8)
Successful closure						
No	148 (67.9)	106 (58.2)	154 (67.8)	103 (59.5)	132 (62.3)	107 (56.9)
Yes	70 (32.1)	76 (41.8)	73 (32.2)	70 (40.5)	80 (37.7)	81 (43.1)

Note. Number and (percentage) provided. Sample size (n = 400) the same for each racial/ethnic group. LTHS = less than high school diploma.

CORRELATION MATRICES WITH VARIANCES ALONG THE DIAGONAL (CALIBRATION)

Table 10. Correlation Matrix With Variances (Whites n = 400)

Variables	1	2	3	4	5
1. Gender	.249				
2. Significant disability	-.055	.084			
3. Public support	-.051	.092	.247		
4. Education at application	.084	-.032	-.032	1.337	
5. Status 26	.100	-.098	-.003	.120	.232
Mean	.46	.91	.44	1.40	.37

Table 11. Correlation Matrix With Variances (Blacks n = 400)

Variables	1	2	3	4	5
1. Gender	.246				
2. Significant disability	-.087	.067			
3. Public support	-.112	.069	.250		
4. Education at application	.059	-.004	.108	.949	
5. Status 26	.086	-.113	.012	-.032	.230
Mean	.43	.93	.47	1.03	.36

Table 12. Correlation Matrix With Variances (Hispanics n = 400)

Variables	1	2	3	4	5
1. Gender	.250				
2. Significant disability	-.001	.082			
3. Public support	-.020	.104	.237		
4. Education at application	.033	.010	.095	.953	
5. Status 26	.054	-.063	-.038	.082	.241
Mean	.47	.91	.38	.79	.40

Research Question 1.0

Research question 1.0 was intended to generate knowledge about the implied measurement model for QEO. The measurement model was tested using confirmatory factor analysis (CFA) and WLSMV estimation. Multiple group equality constraints were imposed to assess measurement invariance across three racial/ethnic groups. The final QEO model (Figure 5) was indicated by three observed variables (weekly earnings at closure, medical insurance coverage provided, and hourly wages at closure). Prior to data analysis, non-normal income data were transformed using a 90% windsorizing technique. The natural log transformation was used during the analysis to normalize the variances and distributions for the income indicator variables.

MEASUREMENT MODEL FIT

There was good model fit for the calibration sample (χ^2 *p*-value = .3383, CFI = .999, RMSEA = .011, WRMR = .616) and validation sample (χ^2 *p*-value = .1723, CFI = .991, RMSEA = .039, WRMR = .740). As such, no modifications were made to the proposed measurement model. Table 13 compares the QEO model fit results with recommended values.

Table 13. QEO Measurement Model Fit Results and Recommended Values

	χ^2 *p*-value	CFI	RMSEA	WRMR
Calibration	.3683	.999	.011	.616
Validation	.1723	.991	.039	.740
Recommended values	> .05	≥ .95	≤ .06	≤ 1.0

Note. WLSMV utilizes a mean and variance adjusted chi-square. The relevant fit index for chi-square is the *p*-value.

QUALITY OF THE LATENT CONSTRUCT

The coefficient patterns, construct reliability, and variance extracted were above the acceptable ranges for each racial/ethnic group (see Table 14) (Hancock & Mueller, 2001, Kline, 2005). Appendix C provides the formulas used for calculating coefficient H (i.e., construct reliability) and variance extracted. Generally, the pattern coefficients were medium to large and the variance explained by the indicators was more than 60%. All structure coefficients were in the anticipated direction. The test for multiple-group equality indicated measurement invariance across racial/ethnic groups. Figure 5 illustrates the final measurement model with standardized coefficients and errors.

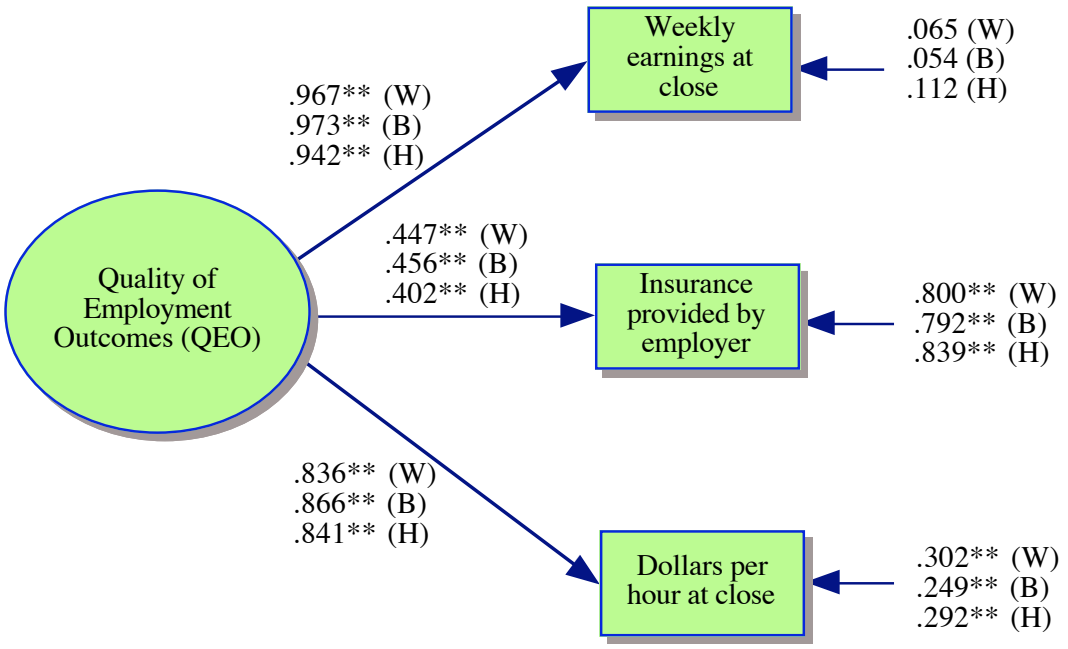


Figure 5. Final QEO Measurement Model With Standardized Coefficients and Error Variances

Note. **$p < .01$. W = White; B = Black; H = Hispanic.

Table 14. QEO Measurement Model Construct Reliability and Variance Extracted

	Calibration Sample			
	W	B	H	Recommended values
Construct reliability	.944	.954	.913	>.70 or .80
Variance extracted	.611	.635	.585	>.50

Note. Construct reliability and variance extracted provided for calibration sample. W= White; B = Black; H = Hispanic.

Research Question 1.1

Question 1.1 pertained to racial/ethnic variation in the QEO measurement model in the event of statistically significant variation between groups. However, the results for research question 1.0, as described above, indicated measurement invariance across the racial/ethnic groups. In other words, the findings suggest the QEO measurement model does not vary by racial/ethnic group. As such, the results for research question 1.1 (i.e., how does the model vary?) were provided and subsumed by the results from question 1.0.

Research Question 2.0

Research question 2.0 and its analysis were intended to generate knowledge about the homogeneity of the structural model for the implied relationship between personal history characteristics and QEO for three racial/ethnic groups in the first population of interest. WLSMV estimation procedures were used for analysis, and multiple group equality constraints were imposed to examine structural model invariance. Prior to data analysis, non-normal income data (hourly wage and weekly earnings at application and weekly earnings at closure) were transformed using a 90% windsorizing technique. The natural log transformation was used during the analysis to normalize the variance and distribution for the income variables.

STRUCTURAL MODEL FIT

The implied structural model indicated poor fit in both samples: calibration (χ^2 *p*-value = .000, CFI = .769, RMSEA = .073, WRMR = 2.087) and validation (χ^2 *p*-value = .000, CFI = .776, RMSEA = .082, WRMR = 2.200). As such, the implied structural model for personal history characteristics and QEO, as depicted in Figure 2, was not plausible as a homogenous model across racial/ethnic groups. To further explore these findings, research question 2.1 was analyzed to identify a more plausible structural model and to account for racial and ethnic group variation.

Research Question 2.1

The purpose of question 2.1 was to produce knowledge about variations in the implied structural model across racial/ethnic groups. This analysis was guided by the existing empirical literature, which suggests racial/ethnic variation in VR outcomes and indicates predictors of VR outcomes, and the LaGrange Multiplier test. The Lagrange Multiplier test was used to detect plausible racial/ethnic variations in the structural model of the calibration sample data. Seven statistically significant constraints were released to modify the model, including constraints for the direct effects of gender (Whites and Hispanics), public support (all racial/ethnic groups), and significant disability (Hispanics). The seventh statistically significant constraint was released for the covariance between public support and significant disability for Hispanics. These constraints were released in a stepwise manner and using the order of magnitude as a guide (Jöreskog, 1993). In addition, four non-statistically significant covariance paths were trimmed in the structural model to achieve goodness of fit (Kline, 2005). As such, the final respecified model, illustrated in Figure 6, differed from the originally proposed model.

RESPECIFIED MODEL FIT

The aforementioned modifications improved the goodness of model fit in the calibration sample (χ^2 *p* -value = .1008, CFI = .967, RMSEA = .028, WRMR = 1.263); however, the WRMR was larger than recommended. Yu (2002) and others have noted that WRMR can be sensitive to large sample sizes and that one unacceptable fit index should not be used to reject a model if all other fit indices are in the acceptable range. Figure 6 illustrates the final modified model and provides the standardized path coefficients and disturbances for each racial/ethnic group. Non-significant covariance paths that were redundant (i.e., non-significant for each racial group) were removed from the illustration to enhance model interpretation (Keith, 2006).

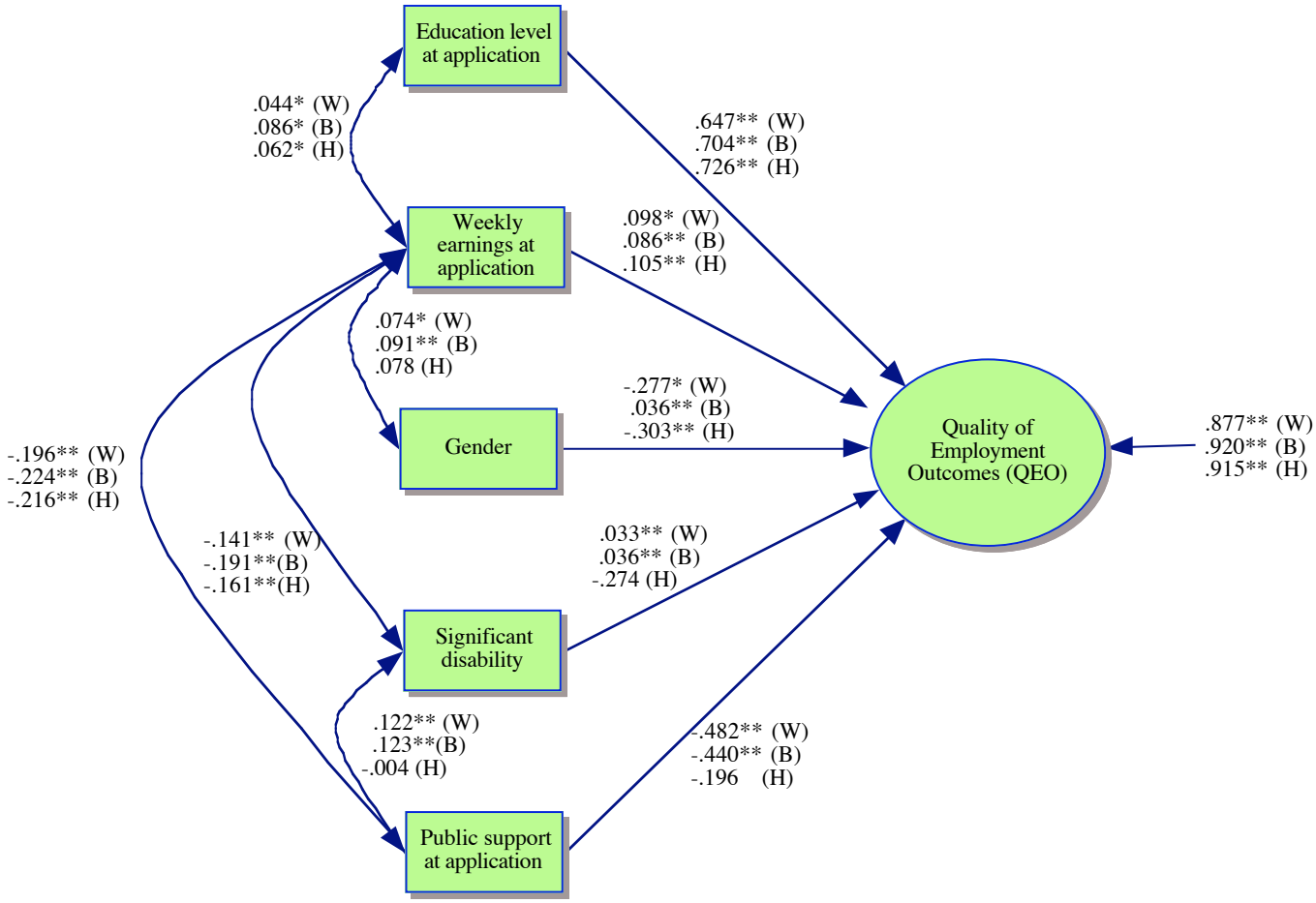


Figure 6. Modified Structural Model for the Statistical Relationships Between Personal History Characteristics and QEO

Note. Standardized estimates for calibration sample provided. *$p < .05$, **$p < .01$. W = White; B = Black; H = Hispanic.

The respecified model was retested to assess predictive validity. The validation sample results indicated adequate model fit on two of four indices (χ^2 *p*-value = .0278, CFI = .952, RMSEA = .035, WRMR = 1.350). However, Fan, Thompson, and Wang (1999) have reported that CFI and RMSEA indices are less influenced by large sample sizes. Table 15 compares the initial and final model fit results for the calibration and validation samples.

Table 15. Initial and Final Structural Model Fit Indices (Question 2.1)

	χ^2 *p*-value	CFI	RMSEA	WRMR
Calibration initial model	.0082	.769	.082	2.080
Calibration final model	.1008	.967	.028	1.263
Validation	.0278	.952	.035	1.350
Recommended fit values	> .05	≥ .95	≤ .06	≤ 1.0

STRUCTURAL MODEL VARIATION BY RACE/ETHNICITY

The standardized coefficients and results in the calibration sample indicated several statistically significant differences in the implied structural model by race/ethnicity. Public support had a negative effect on QEO for Blacks and Whites; however, there was no statistically significant effect for Hispanics. Similarly, significant disability had a small but significant effect on QEO for Blacks and Whites; however, there was no direct effect for Hispanics. QEO also varied by race/ethnicity and gender. Hispanic and White females attained lower QEO compared to their male peers. Many covariance paths differed by racial/ethnic group, most notably the covariance for public support at application with significant disability, which was positive and significant for Blacks and Whites, but not Hispanics. Education level at application (i.e., college degree) had a statistically significant effect on QEO for all racial/ethnic groups. Overall, the structural model explained 12.3% of the variance in QEO for Whites, 8% for Blacks, and 8.5% for Hispanics.

While the calibration sample results indicated several structural variations by race/ethnicity, the coefficient estimates for significant disability and weekly earnings at application did not cross-validate. In addition, the non-statistically significant effect of public support on QEO did not cross-validate for Hispanics. As such, these paths were sample-specific. Table 16 provides a simplified effect decomposition summary and compares the path coefficients results for the calibration and validation samples. The variance explained for the validation sample was slightly different from the calibration sample. Overall, the validation model explained 12.1% of the variance in QEO for Whites, 4.1% for Blacks, and 9.7% for Hispanics.

Table 16. Effect Decomposition by Race/Ethnicity for Calibration and Validation

Estimated Path	Direct Effects	
	Calibration	Validation
Gender	-.277** (W)	-.238* (W)
	.036** (B)	.004 (B)
	-.303** (H)	-.402** (H)
Significant disability	.033** (W)	.004 (W)
	.036** (B)	.004 (B)
	-.274 (H)	-.001 (H)
Education level at application (college)	.647** (W)	.545** (W)
	.704** (B)	.605** (B)
	.726** (H)	.572** (H)
Weekly earnings at application	.098* (W)	.011 (W)
	.086** (B)	.010 (B)
	.105** (H)	.011 (H)
Public support	-.482** (W)	-.634** (W)
	-.440** (B)	-.316** (B)
	-.196 (H)	-.468** (H)

Note. Estimated paths provided for effect on QEO. All direct effect values are standardized. * $p < .05$, ** $p < .01$. W = White; B = Black; H = Hispanic.

Research Question 3.0

The purpose of question 3.0 was to generate knowledge about the influence of race/ethnicity on QEO using a MIMIC approach. The MIMIC model, depicted in Figure

3, regresses QEO on racial/ethnic status and other personal history variables. Racial/ethnic group status and education level at application were dummy coded for the MIMIC analysis using the J-1 dummy coding technique (Keith, 2006).

STRUCTURAL MODEL FIT

The originally proposed MIMIC model (Figure 3) indicated poor fit on two of four indices (χ^2 p-value = .0022, CFI = .739, RMSEA = .043, WRMR = .945). The model was respecified by trimming several non-significant covariance paths (Keith, 2005). The final modified model, illustrated in Figure 7, indicated good fit on three of four indices (χ^2 p-value = .0787, CFI = .917, RMSEA = .029, WRMR = .998) and was nested in the originally proposed model. A chi-square difference test was conducted using the DIFFTEST command in Mplus to compare the nested models (Muthén & Muthén, 2007). The chi-square difference test results (χ^2 p-value = .7317) indicate the two models are not statistically different. Although the final MIMIC model for the calibration sample indicated relatively good fit, the cross-validation indicated poor model fit on three of four indices (χ^2 p-value = .0315, CFI = .896, RMSEA = .032, WRMR = 1.032). Thus, the goodness of model fit (Figure 7) for MIMIC was not stable across independent samples.

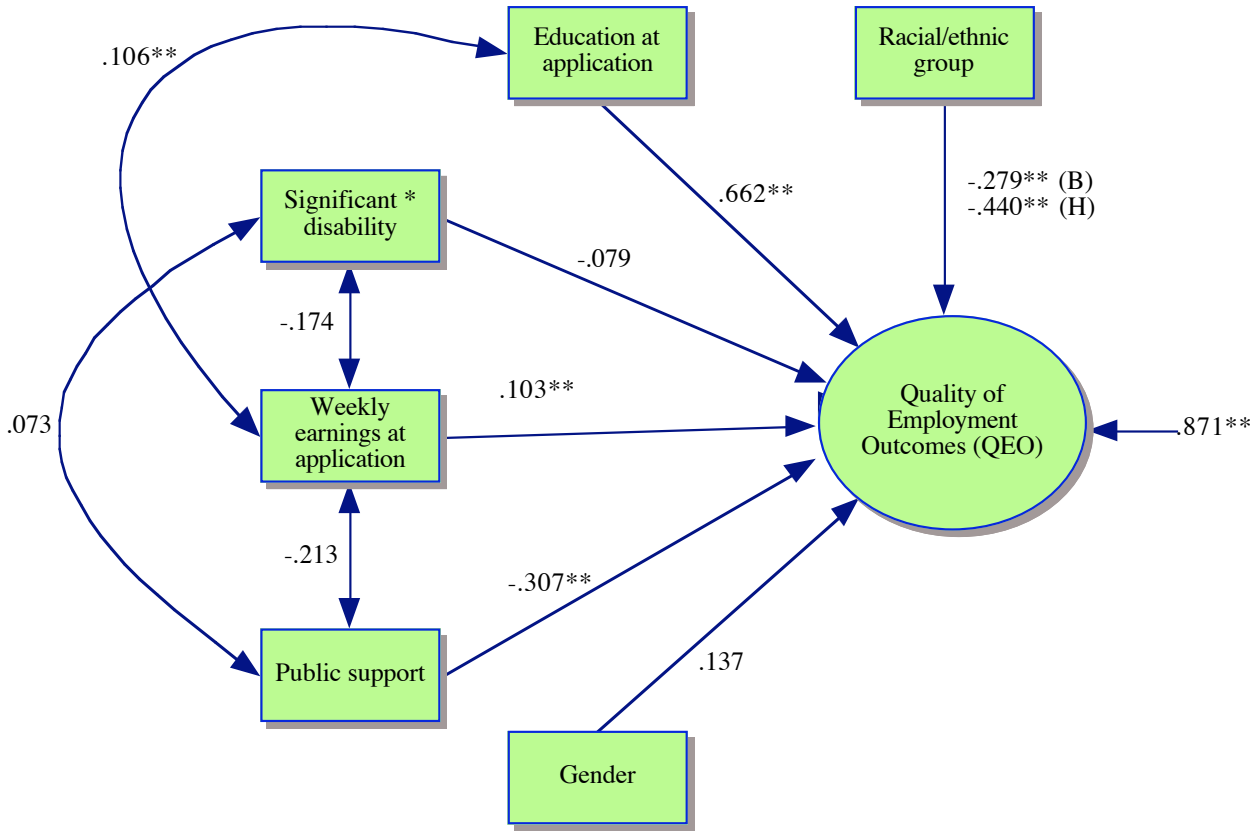


Figure 7. Final MIMIC Model Indicating the Influence of Racial/Ethnic Group Status on QEO

Note. Standardized estimates for calibration sample provided. **$p < .01$. B = Black; H = Hispanic

STRENGTH OF RELATIONSHIPS BETWEEN VARIABLES OF INTEREST

The salient coefficients for question 3.0 were the direct effects of race/ethnicity on QEO. Figure 7 indicates statistically significant and negative direct effects for Blacks (ß = -.279) and Hispanics (ß = -.440) on QEO compared to the White reference group. These results suggest that Black or Hispanic racial/ethnic status was a predictor of lower QEO when compared to Whites. The R^2 indicated the MIMIC model explained 12.9% of the variance in QEO. The effect sizes for Blacks (-.299) and Hispanics (-.471) were medium according to Cohen (1998). The effect sizes for the MIMIC model were calculated by dividing the direct effect estimates by the square root of the residual variance (.871), which can be described as the pooled standard deviation (Thompson & Green, 2006). Similar to the findings for question 2.1, there were statistically significant positive effects for education and negative effects for public support on QEO.

The MIMIC model cross-validation revealed similar coefficient estimates and explained variance; however, the validation sample findings should be viewed in light of the poor model fit. Table 17 provides a simplified effect decomposition summary and compares calibration and validation coefficient estimates.

Table 17. MIMIC Model Effect Decomposition for Calibration and Validation

Estimated Path	Direct Effect	
	Calibration	Validation
Race/ethnicity		
Black	-.279**	-.280**
Hispanic	-.440**	-.422**
Gender		
Female	.137	.196
Significant disability		
Yes	-.079	.011
Education level at application		
High school degree	.036	-.043
MTHS	.370**	.358**
Associate/technical degree	.263*	.490**
BA or higher	.662**	.587**
Weekly earnings at application	.103**	.038
Public support		
Yes	-.307**	-.409**

Note. Estimated paths provided for effect on QEO. All direct effect values are standardized. Reference groups are White, male gender, no significant disability, less than high school, no public support. *$p < .05$, **$p < .01$.

Research Question 3.1

The purpose of question 3.1 was to compare the MIMIC model findings to a multiple regression with weekly earnings as the endogenous variable. Race was entered separately from the other variables to obtain the ΔR^2. The regression model was tested using SPSS. Table 18 compares coefficient estimate results for questions 3.0, 3.1, and 3.2.

MODEL RESULTS AND ESTIMATES

Overall, the regression model was statistically significant ($F = [10, 1198] = 24.782$, $p = .000$), meaning the model was predictive of weekly earnings. The model R^2 was 17.2%. Hispanic ethnicity was a statistically significant predictor of weekly earnings

at closure (b = -.120, ß = -.104, t = - 3.310); however, race (Black) was not significant. Gender, public support, and all levels of educational attainment were also statistically significant. The R^2 contribution for the race/ethnicity variable was .008 (less than 1.0%). The measure of practical importance, calculated as the square root of ΔR^2, was .089 or 8.9% (Keith, 2006). The validation sample indicated similar results (F = [10, 1198] = 21.50, p = .000, R^2 = .153). Hispanic ethnicity was a statistically significant predictor of weekly earnings at closure (b = -.083, ß = -.070, t = - 2.180). R^2 contribution for race/ethnicity was .004, and the measure of practical importance was 6.32%.

Research Question 3.2

The purpose of question 3.2 was to compare the MIMIC model findings to a multiple regression with hourly wages as the endogenous variable. Table 18 compares coefficient estimate results for questions 3.0, 3.1, and 3.2.

MODEL RESULTS AND ESTIMATES

The results for question 3.2 were similar to those for question 3.1 with the exception of the direct effect for significant disability. The regression model was statistically significant (F = [10, 1198] = 23.664, p = .000), meaning the model was predictive of hourly wages at closure. The model R^2 was 16.6%. Hispanic ethnicity was a statistically significant predictor of weekly earnings at closure (b = -.105, ß = -.130, t = -4.131); however, race (Black) was not a significant predictor. Gender, public support, weekly earnings at application, and all levels of educational attainment were also statistically significant. The R^2 contribution for race/ethnicity was .012 (1.2%). The measure of practical importance was 10.9%. The cross-validation results were similar (F = [10, 1198] = 20.245, p = .000, R^2 = .145). Hispanic ethnicity was a statistically

significant predictor of hourly wages at closure (b = -.085, ß = -.106, t = - 3.294). R^2 contribution was .008, and the measure of practical importance was 8.9%.

Table 18. Effect Decomposition Comparison for MIMIC and Regression Models

Estimated Path	Direct Effects		
	MIMIC model[a]	WKC regression[a]	HRC regression[a]
Race/ethnicity			
Black	-.279**	-.036	-.045
Hispanic	-.440**	-.120**	-.105**
Gender			
Female	.137	-.156**	-.085**
Significant disability			
Yes	-.079	-.095*	-.011
Education level at application			
High school degree	.017	.271**	.182**
MTHS	.134**	.376**	.283**
Associate/technical degree	.076*	.360**	.279**
BA or higher	.662**	.478**	.415**
Weekly earnings at application	.103**	.068*	.067*
Public support			
Yes	-.307**	-.218**	-.070**

Note. [a] Calibration sample estimates provided. Reference groups are White, male gender, no significant disability, less than high school, no public support. *$p < .05$, **$p < .01$. WKC = weekly earnings at closure; HRC = hourly wages at closure.

Research Question 4.0

The purpose of question 4.0 was to test an implied path model for the relationship between three personal history characteristics (gender, education level at application, and public support) and closure status for consumers who were unemployed at application to VR. Multiple group equality constraints were imposed to examine model homogeneity across racial/ethnic groups. WLSMV estimation procedures were used. Prior to data analysis, a significantly skewed distribution was detected for the significant disability

variable (skew = -2.84, SE = .122). Additional data screening indicated the vast majority of participants in the calibration sample (more than 91%) reported a significant disability. As such, this variable was removed from the model due to lack of variability.

PATH MODEL FIT

The implied model could not be estimated because the chi-square test for the baseline model was not significant (χ^2 *p*-value = .8125). A significant baseline model is a statistical assumption for structural equation modeling. The results indicate little overall variability or statistically significant difference among the observations at the beginning of the analysis. The validation sample also violated the baseline model assumption (χ^2 *p*-value = .6308). A traditional chi-square test using SPSS software was conducted to confirm the aforementioned calibration sample findings. All chi-square tests between the exogenous variables and closure status were non-significant, with the exception of gender (χ^2 (1, n = 1200) = 7.842***, ϕ = .081).

Research Question 4.1

Question 4.1 was intended to generate knowledge about group characteristics that influence closure status. Logistic regression was used to regress closure status on three exogenous variables (gender, education level at application, and public support) for each racial/ethnic group.

LOGISTIC REGRESSION FINDINGS

There were few statistically significant findings in the calibration samples. However, education level at application was a significant predictor for White and Hispanic participants. White consumers with an associate or technical degree at time of VR application were more than twice as likely to attain a successful closure (B = .784, Wald = 3.939, Exp(B) = 2.190). White females had higher education levels at application

to VR compared to other racial/ethnic groups. The Nagelkerke R^2 for the White group was .033. Among Hispanics, consumers with a high school diploma were about twice as likely to attain a successful closure (B = .656, Wald = 8.283, Exp(B) = 1.927). The Nagelkerke R^2 for the Hispanic group was .037. Within the Black group, there were no statistically significant effects.

The calibration sample findings described above did not cross-validate. The validation sample indicated different coefficient results for each racial/ethnic group. Thus, the findings were sample-specific for question 4.1.

Research Question 4.2

For question 4.2, race/ethnicity was included in the logistic regression model to examine the influence of race/ethnicity on closure status, while controlling the other variables in the model.

LOGISTIC REGRESSION FINDINGS

The regression model was statistically significant; however, the primary variable of interest, race/ethnicity, was not a statistically significant predictor of successful closure. Among the variables in the model, gender was a significant predictor of closure status. Women who were unemployed at VR application were approximately 1.4 times more likely to be successfully closed compared to men. The Nagelkerke R^2 was .020.

However, the findings for question 4.2 did not cross-validate. There were no statistically significant findings for race or gender in the validation sample. Table 19 provides and compares the logistic regression estimates and odds ratios for the calibration and validation samples. The results for question 4.2 should be viewed cautiously considering the lack of cross-validation stability.

Table 19. Logistic Regression Estimates for the Influence of Race on VR Closure Status

Variable	Calibration			Validation		
	B	Wald	Exp(B)	B	Wald	Exp(B)
Race/ethnicity						
Black	.005	.001	1.005	-.069	.213	.933
Hispanic	.210	1.920	1.233	.217	2.101	1.242
Gender (female)	.333	7.578	1.395**	.070	.334	1.073
Public support	-.070	.326	.933	-.232	3.524	.793
Education level						
HS diploma	.301	4.438	1.352*	.494	11.582	1.638**
MTHS	.073	.149	1.076	.618	11.436	1.855**
AA or technical	.555	4.592	1.742*	.282	1.031	1.326
BA or higher	.206	.423	1.229	.675	4.959	1.964*
Constant	-.885	29.369	.413**	-.865	29.919	.421**

Note. Reference groups are White, male gender, less than high school, no public support.
*$p < .05$, **$p < .01$.

CHAPTER 5

DISCUSSION

This study examined racial/ethnic disparities in VR outcomes using SEM, a relatively new approach for RSA 911 disparities research. In the first stage of analysis, the QEO measurement model was developed and tested. The second stage of analysis involved testing the implied structural models. In addition, traditional regression analyses were conducted and compared to the SEM findings. This chapter provides an interpretation of the research results for the calibration sample identified in Chapter 4, and summarizes study limitations and recommendations for future research.

Research Question 1.0

1.0 Does the implied measurement model for quality of employment outcome (QEO) fit the observed data for multiple racial and ethnic groups?

1.1 If not, how does the QEO measurement model vary by race/ethnicity?

EVALUATING THE MEASUREMENT MODEL

Research questions 1.0 and 1.1 pertained to the goodness of fit and invariance of the QEO measurement model. The CFA analysis and related test results indicate good model fit for QEO and strong relationships between the indicator variables for the calibration sample (i.e., weekly earnings at closure, medical insurance coverage provided, and hourly wages at closure). The indicator variables can be described as consequences or reflections of QEO. The path loadings were large; however, the QEO effect was medium for one of the three variables (medical insurance provided by employer) (Thompson & Green, 2006; Hancock & Mueller, 2001). Kline (2005, p. 122) notes that

"standardized path coefficients with absolute values less than .10 may indicate a small effect; values around .30 indicate a typical or medium effect; and those greater than .50, a large effect." The measurement model results were replicated in the validation sample, which suggests the findings were stable across two independent samples from the same population (Kline, 2005). Thus, the results suggest the CFA model was not disconfirmed.

CROSS-GROUP MEASUREMENT INVARIANCE

Additionally, the results indicate measurement invariance, which means the QEO measurement model was equivalent across racial/ethnic groups. Thus, QEO, the latent variable of interest, can be described as a satisfactory, albeit modest, outcome measure for research with each racial/ethnic group (Little, 2000). Compared to previous VR racial/ethnic variation research, the QEO latent variable may offer a slightly broader perspective on VR employment outcomes, as prior studies have used single observed variables as criteria (i.e., hours worked or weekly earnings).

RESEARCH QUESTION 1.1: VARIATIONS IN THE MEASUREMENT MODEL

Research question 1.1 pertained to potential variation in the QEO measurement model. However, there was no racial/ethnic variation in the measurement model. Indeed, the findings for research question 1.1 were addressed and subsumed by question 1.0, as the aforementioned results indicated (1) goodness of model fit, (2) a strong pattern of relationship among indicators, (3) good construct reliability and variance extracted, and most importantly, (4) measurement invariance. To reiterate, QEO can be described as an acceptable latent construct for White, Black, and Hispanic participants in this study.

Research Question 2.0

2.0 Does the structural model regressing QEO on personal history characteristics fit the observed data for multiple racial and ethnic groups?

2.1 If not, how does the structural model vary by race/ethnicity?

EVIDENCE OF POOR MODEL FIT

For research question 2.0, a structural model was tested for the implied relationship between personal history characteristics and QEO across three racial/ethnic groups (see Figure 2). As previously described, multiple group equality constraints were imposed to assess the homogeneity of the structural model. The test results indicate the initial structural model is a poor fit and not homogenous across all groups. In other words, the structural model, as illustrated in Figure 2, does not adequately reflect the observed data for White, Black, and Hispanic consumers in the calibration or validation samples. In fact, a review of the Lagrange Multiplier test results implies that race/ethnicity interacts with personal history characteristics to influence QEO. Though the analysis results suggest potential heterogeneity, the initial findings do not explain how the structural model was dissimilar by race/ethnicity. Research question 2.1 was intended to explore and test variations in the structural model by race/ethnicity.

RESEARCH QUESTION 2.1: VARIATIONS IN THE STRUCTURAL MODEL

In research question 2.1, the initial model was respecified to achieve goodness of fit through model building and trimming. In doing so, variations in the structural model were identified by race/ethnicity for the direct effects of public support, gender, and significant disability. These variations provide a better reflection of the observed data for each racial/ethnic group.

Public Support

Public support had a medium and negative effect on QEO for Blacks and Whites in the calibration sample. In other words, a decrease in QEO was predicted by public support. However, the effect was not statistically significant for Hispanics in the

calibration sample. Interestingly, the negative effect of public support was statistically significant for all three racial/ethnic groups in the validation sample. The results of question 2.1 suggest that public support is a relevant structural influence for understanding and potentially addressing QEO disparities. Indeed, research on work disincentives and VR outcomes has indicated that some forms of public support can function as a barrier to higher quality employment outcomes (Saunders et al., 2006; Tremblay et al., 2006). Many VR consumers who receive public support earn lower wages and might be reluctant to relinquish government-sponsored health care or other benefits (Berry, Price-Ellingstad, Halloran, & Finch, 2000). Thus, the findings for question 2.1 reinforce the existing literature.

The results related to public support and QEO suggest the potential utility of benefits counseling, which might improve QEO for VR consumers (Tremblay et al., 2006). Few RSA 911 studies with a primary emphasis on race/ethnicity and VR outcomes have included public support as a predictor or exogenous variable to examine this relationship.

Gender

The results of question 2.1 also indicate structural variation by race/ethnicity and gender. Gender (female) was negatively associated with QEO for Whites and Hispanics. Overall, women earned lower wages and were less likely to receive employment-provided medical insurance coverage. This finding differs from previous VR research that reported no statistically significant gender effects in VR employment outcomes (Capella, 2002; Saunders et al., 2006). The difference in findings for the present study may be related to the SEM approach, the QEO latent variable, or the specific geographic region examined. The validation sample results were similar; however, there was no significant gender effect for Blacks.

Significant Disability

The results also indicate small direct effects for significant disability on QEO for Whites and Blacks in the calibration sample; however, the effect of significant disability was negative and not statistically significant for Hispanics. Many previous studies, particularly those published after the 1992 Rehabilitation Act Amendments, have correlated significant disability with successful VR outcomes. However, it is not readily apparent why significant disability was not a significant predictor for Hispanics. The utility of these findings are limited as the standardized coefficient is small and the results were not replicated in the validation sample. More specifically, there were no statistically significant effects of significant disability on QEO in the validation sample.

Education Level

The results from question 2.1 also indicate medium to large direct effects for educational attainment (i.e., college degree or higher) on QEO for each racial/ethnic group. All direct effect estimates for education level (college level) were replicated in the validation sample. These findings suggest that educational attainment is structurally important for QEO for each racial/ethnic group. For consumers in VR, having a bachelor's degree or higher at application is predictive of increased QEO. However, the aggregate results of the present study, particularly the MIMIC model results for question 3.0, suggest that education alone does not explain variations in QEO.

APPLICABILITY TO THE VR POPULATION

It is essential to reiterate that it was necessary to respecify the initial structural model for personal history characteristics and QEO to achieve goodness of fit. Furthermore, the validation sample indicated poor fit on two of four indices. As such, the

results and interpretations for question 2.1 may be sample-specific. The RMSEA and CFI indices, which are well suited for large sample sizes, were in the acceptable range; however, additional research would be needed to generalize the calibration sample findings to the VR population (Fan et al., 1999).

Research Question 3.0

3.0 Does the MIMIC model indicate racial/ethnic group differences in QEO?

3.1 How does the regression model with weekly earnings as the endogenous variable compare to the MIMIC model?

3.2 How does the regression model with hourly wages as the endogenous variable compare to the MIMIC model?

INTERPRETATION APPROACH

Question 3.0 and its sub-questions (3.1 and 3.2) are best understood in aggregate. Question 3.0 utilized a MIMIC approach to test the influence of race/ethnicity on QEO with other variables in the model. In many ways, the MIMIC approach can be described as a multiple regression model that includes a latent construct, covariance paths, and endogenous error variances. Conversely, questions 3.1 and 3.2 tested for racial variation using the more traditional multiple regression approach and a single criterion variable (e.g., weekly earnings, hourly wages). For each question, the primary path and coefficient of interest was race/ethnicity. This section discusses common and conflicting findings that were discovered using the MIMIC and multiple regression approaches.

COMMON FINDINGS AMONG MIMIC AND REGRESSION MODELS

For each question, Hispanic ethnicity was negatively associated with QEO compared to the White reference group. These findings differ from previous research by Capella (2002), who reported better employment outcomes for Hispanics. The difference

in findings might be explained by variations in geographic region, type and quality of VR services, or the operational definition of Hispanic.

CONFLICTING FINDINGS AMONG MIMIC AND REGRESSION APPROACH

The most salient difference between the MIMIC and regression models was for the effects of race (Blacks and Whites) on QEO. Similar to prior research (Feist-Price, 1995; Walker et al., 1995; Wilson, 1997), the MIMIC model results indicate a statistically significant decrease in QEO for Blacks as compared to Whites. Conversely, the regression models (questions 3.1 and 3.2) indicate no statistically significant difference in QEO between Blacks and Whites. The MIMIC model direct-effect estimates for race/ethnicity can be described as medium. Conversely, traditional regression model estimates for race/ethnicity are small.

IMPLICATIONS

Generally, the findings from questions 3.0—3.2 reinforce the existing literature base on racial disparities. The "new" SEM approach (i.e., MIMIC model) contributes to the knowledge base in new ways conceptually. Overall, these results reiterate that reports of racial/ethnic variation in employment outcomes depend, in part, on the statistical procedures and outcome variable used. In this study, the MIMIC model used a slightly broader construct and outcome measure for employment outcomes compared to the regression approach. MIMIC also modeled additional measurement error. It is plausible that the MIMIC approach detected racial variation in QEO that the traditional regression approach did not because of the more complex latent construct and the modeling of error variance.

Though the results for research questions 3.0–3.2 are insightful, all calibration results did not cross-validate. Several MIMIC results were not stable for the model fit

indices and coefficients. Many, but not all, of the regression model results were validated in an independent sample. Sample-specific results are not uncommon in multivariate analysis (Keith, 2006); however, it is less likely that the MIMIC findings from question 3.0 can be generalized to the VR population of interest.

Research Question 4.0

4.0 Does the structural model regressing VR closure on personal history characteristics fit the observed data for multiple racial and ethnic groups?

4.1 If not, how does the regression model vary by race/ethnicity?

4.2 Does the regression model indicate racial/ethnic group differences in closure status?

Evidence of Poor Model Fit

Research question 4.0 was designed to test an implied path model for VR closure for consumers who were unemployed at application to VR. However, the proposed model could not be estimated because the baseline chi-square was not statistically significant. In SEM analyses, there is a statistical assumption that observations in the covariance matrix differ at the start of the SEM analysis (Kline, 2005). The violation of the statistical assumption suggests model misspecification and relatively little variation between the racial/ethnic groups on the variables of interest and VR closure status. In short, the findings indicate that variation was insufficient to test for the implied structural relationship, as illustrated in Figure 4.

Education Level as Predictor of Closure Status

Research question 4.1 involved a logistic regression for the predictive influence of education level, gender, and public support on closure status. A separate logistic regression was conducted for each racial/ethnic group. White females had higher

education levels at application to VR compared to other racial/ethnic groups. The results indicate that White and Hispanic consumers with an associate degree or a high school diploma were more likely to be successfully closed. However, the data do not explain why these two education levels were more predictive of VR closure. Unfortunately, the findings for question 4.1 did not cross-validate; thus, the results for question 4.1 were sample-specific.

RACIAL OR ETHNIC SIMILARITY IN SUCCESSFUL CLOSURE

Research question 4.2 involved a logistic regression for the predictive influence of race/ethnicity on VR closure, while controlling for the other variables in the model. The results indicated no racial/ethnic variation in successful closure status. The findings suggest that regardless of race/ethnic group status, consumers who were unemployed at time of VR application attained similar VR closure status outcomes. With the exception of Peterson (1996), who also reported no statistically significant racial differences in closure status, the findings for question 4.2 differ from previous research. In light of the results for question 4.0, which indicated little variability in the baseline model, the findings of no racial variation in closure status were not surprising. Although gender was not the primary focus for question 4.2, there was a main effect for gender in the calibration sample. Females were 1.4 times more likely to be successfully closed. However, the findings for question 4.2 did not cross-validate. There were no statistically significant effects for gender in the validation sample.

IMPLICATIONS

Overall, the results for questions 4.0–4.2 should be interpreted cautiously. The implied path model for question 4.0 could not be estimated as there was relatively little variability for statistical analysis. While it appears there was no racial variation in closure

status for the calibration sample, the results for questions 4.1 and 4.2 did not cross-validate.

Limitations

There were several limitations to this study related to the QEO construct, data transformations, potential misspecification, cross-validation, and RSA 911 data quality. In addition, it is important to note that SEM analyses do not prove causality or that a model is correct.

QEO Is a Modest Measure

In general, a minimum of three indicators is needed to form a latent construct; however, more indicators are recommended (Kline, 2005). The QEO construct, which can also be described as a one-factor solution, included three indicators as required; however, two of the variables (weekly earnings and hourly wages) were closely correlated ($r > .82$) in the Black and White consumer groups. Close correlation or multicollinearity between indicators limits the explanatory power of the latent construct (Kline, 2005). Thus, the QEO construct, while statistically adequate, is a relatively modest outcome measure.

In addition, QEO could be conceptualized as a multi-factorial construct (i.e., two-factor, three-factor, or higher-order solution) with additional objective and subjective indicators. This study was limited by the variables available in the RSA 911 to develop and test the QEO measurement model.

The Challenge of Data Transformation

Transforming data is a common practice in multivariate research, and several variables in this study were transformed to address outliers and non-normal distribution patterns (McDonald & Ho, 2002). To address this problem, income data were

windsorized and transformed using the natural log. However, transforming data means the model fit reports and estimates may differ from the original data (West, Finch, & Curran, 1995). Transformations also make the interpretation of findings more challenging with regard to previous studies. In particular, the scales used in this study for earnings are not equivalent to previous studies that did not use similar transformations. However, the general trends regarding income differences are applicable (Osborne, 2002).

MISSPECIFICATIONS AND ALTERNATIVE MODELS

When conducting SEM, there is the potential for model misspecification—that is, an error in the inclusion or omission of variables in the model (Hoyle, 1995; Kline, 2005). For example, demand-side aspects of employment were not included in the conceptual model. Demand-side aspects, such as unemployment rates or employer attitudes, might influence a VR outcome (Hernandez et al., 2006). Competition for jobs is also a relevant variable, as individuals with disabilities must compete against their non-disabled peers for employment (Baker et al., 2007). In addition, consumers' age might play a role in lower QEO, particularly for younger workers with relatively few career or professional experiences. According to a systematic review by Saunders et al. (2006), many VR studies indicate that older consumers have better employment outcomes; however, roughly the same number of VR studies indicate opposite findings.

The influence of disability type might also explain racial disparities for Blacks. Less than one half (46.5%) of Blacks in the first calibration sample reported a sensory or physical impairment; the majority (53.5%) reported a cognitive, psychosocial, or other mental impairment. Conversely, the majority of Whites and Hispanics reported physical and sensory disabilities. Garske (2003) has noted that individuals with mental disabilities face greater challenges in gaining employment compared to persons with physical

disabilities. Indeed, persons with cognitive impairments and mental illness encounter many acts of discrimination in the employment sector (Olsheski & Schelat, 2003).

Consumers' attitudes, attributions, or motivation toward the VR system or work could potentially vary by race/ethnicity and influence QEO (Saunders et al., 2006). Previous studies have indicated that consumers with a positive attitude and high self-efficacy toward obtaining a job were more likely to achieve a successful employment outcome (Saunders et al., 2006).

In addition, counselor-related factors that are known to influence VR outcomes were not included in the model. For instance, counselors who hold a master's degree have higher rates of competitive closures, especially for consumers with severe disabilities (Szymanski & Parker, 1989).

Finally, there is the potential for an alternative model that includes the same variables as proposed in this study (Kline, 2005; McDonald & Ho, 2002). For example, the strong relationship between race/ethnicity and education level at VR application suggests the potential for an alternative conceptual model with education level as a mediating variable between race/ethnicity and QEO. Such a model would imply a different structural relationship with direct and indirect effects on QEO. In addition, an alternative model might include correlated error variances for QEO indicators. An alternative model with the same variables could indicate similar or better model fit.

CROSS-VALIDATION RESULTS

Cross-validation provides an indication of the stability of the results and findings; however, several research results did not cross-validate with an independent random sample. Thus, several calibration sample findings were sample-specific and not applicable to the population of interest or the VR population as a whole. Sample-specific findings are not uncommon in multivariate analysis (Keith, 2006). Using different cross-

validation methods, such as double cross-validation or validation indices, might improve the validation results (Bollen & Long, 1993).

RSA 911 Data Quality

The RSA 911 is a useful administrative dataset; however, it is not a scientific study or independently conducted survey. RSA 911 data are compiled by VR staff and self-report. There is the possibility of data-entry error or coding mistakes; thus, the exogenous variables are not measured without error. In addition, there was evidence of non-response error in the dataset (Jöreskog, 1993). For instance, 319 cases (2.3%) were missing data on race/ethnicity for the first population and 557 cases (2.5%) were missing data on race/ethnicity for the second population of interest. As such, these consumers could not be included in the study. The RSA provided the raw dataset for this study; however, the RSA did not respond to requests to verify the data accuracy (V. Washington, personal communication, October 7, 2008).

SEM Does Not Prove Causation

SEM is known as causal modeling and uses terminology such as direct effects. However, SEM results do not prove causation because independent variables are not manipulated, nor are latent factors tangible (Kline, 2005; Weston & Gore, 2006). In addition, SEM fit results do not prove that a model is reality; models represent one possible explanation (Kühnel, 2001). SEM is best described as an integrated system of several multiple regression equations (Kline, 2005; Hoyle, 1995). Thus, the results of this study do not prove that race/ethnicity, or the VR process, is the cause of disparities in QEO.

Future Research

The QEO construct, as proposed and tested, was a one-factor solution with three indicator variables. QEO could be elaborated as multi-factorial, however, and include additional indicators that are both objective and subjective (Gilbride et al., 1998; Loprest, 2007). Additional indicators might include consumers' perceptions of the employment environment, attitudes toward employer or coworkers, long-term employment (e.g., 12 months), fringe benefits, or career advancement opportunities. Future research could expand on the QEO construct and test for measurement invariance with additional racial/ethnic groups. As previously noted, the RSA 911 contains few variables for this purpose. Thus, new data collection and analysis would be needed to test a multi-factorial QEO latent construct. In addition, quality of supported employment is also a relevant and complex latent construct, particularly for individuals with severe disabilities, and should be considered in future research (Gilmore, Schuster, Timmons, & Butterworth, 2000).

SEM FOR VR RACIAL DISPARITIES RESEARCH

SEM can provide new insight on racial/ethnic disparities; however, it is important to recognize that SEM is most useful and informative when multiple latent constructs and mediators are modeled along with appropriate modeling of measurement error. SEM can also be used for latent growth modeling to examine structural models and behavioral outcomes over time (Kline, 2005). Future SEM studies on racial/ethnic variation and VR outcomes should include multiple latent variables for constructs such as counselors' cultural competence (Taylor-Ritzler et al., 2008), educational experiences (Szymanski & Parker, 1989), intensity of counseling services (Wheaton et al., 1997), adjustment to disability (Smart, 2001), consumer motivation (Saunders et al., 2006), functional limitation (Bolton et al., 2000), benefits counseling (Tremblay et al., 2006), and

subjective/objective measures for QEO (Gilbride et al., 1998; Loprest, 2007). Among these factors, the role of cultural competence is considered particularly important for rehabilitation counseling. As Leung, Talley, and Flowers (2008) stated, "Our values, our beliefs and behaviors, are influenced by our background, our culture. Understanding how culture influences behaviors is essential to developing better intervention outcomes. Whatever research or service we provide should be conducted using culturally competent providers."

Future SEM studies should also consider the use of latent constructs for consumers' socioeconomic status (SES) or social advantage status. SES is a potentially relevant influence on consumer outcomes and can be conceptualized at the individual, family, or neighborhood level (Bellini et al., 1995; Bolton et al., 2000; Krieger et al., 1997). However, it is essential to note that SES is a formative latent construct, as opposed to a reflective latent construct (Bollen & Lennox, 1991). SEM with a formative latent construct is a more complicated and controversial analysis and requires at least two endogenous latent constructs in order to be identified (Bagozzi, 2007; Howell, Breivik, & Wilcox, 2007).

QUALITATIVE RESEARCH ON "FAILURE TO COOPERATE"

Previous studies have indicated that Black and Hispanic consumers are frequently closed for "failure to cooperate" (Feist-Price, 1995; Rosenthal et al., 2005; Wilson et al., 1999). Although, RSA has defined this term, there is a need to examine the meaning (i.e., connotation) of "failure to cooperate" for VR counselors, consumers, and the counseling process. Some researchers have theorized that a "failure to cooperate" may be a culturally appropriate response to an arduous or culturally insensitive VR process (Dziekan & Okocha, 1993).

CULTURAL COMPETENCE TRAINING

Similar to previous research findings on race/ethnicity and VR outcomes, the results of the current study suggest the need for cultural competence training (CCT) for VR counselors. CCT is intended to improve counselors' awareness, self-awareness, behaviors, knowledge, and abilities to work effectively in cross-cultural situations (Sue & Sue, 2008; Wright & Leung, 1993). Middleton et al. (2000) suggests that CCT should include content on socio-political perspectives and the VR history of disparities. Research by Taylor-Ritzler et al. (2008) reiterates the benefits of CCT for rehabilitation professionals. Ongoing research is needed to explore the effects of cultural competence on VR outcomes.

Conclusion

This study was an effort to apply SEM, a relatively new multivariate technique, to the ongoing research concern of racial/ethnic disparities in VR outcomes (LeBlanc & Smart, 2007; RSA, 2008; Silverstein, Julnes, & Nolan, 2005). The results suggest a plausible measurement model for QEO and variations in the structural model for the relationship between race/ethnicity, personal history characteristics, and QEO in the calibration sample. The results also suggest that race/ethnicity, gender, educational attainment, and public support are predictive of QEO.

The SEM findings differed from results obtained using traditional multiple regression. Multiple regression techniques consist of one regression. Conversely, SEM is a system of regressions and is much broader in scope (Keith, 2006; Kline, 2005). A primary benefit of SEM is the testing of implied relationships between latent constructs. However, without latent constructs, there is relatively little value to using SEM. The present study included a latent construct and, when compared to previous studies,

provides additional insight regarding VR racial/ethnic variation. Although the QEO construct was relatively modest, the SEM approach reinforces the potential benefit of advanced multivariate techniques for rehabilitation and disparities research (Chan et al., 2009). To push the envelope of multivariate research further, there is a need for a improved outcome measures for employment and new high-quality longitudinal data collection on VR consumers and counselors to improve our understanding of the influences of VR outcomes.

Appendixes

APPENDIX A: RACIAL AND ETHNIC VARIATION RESEARCH FINDINGS BY YEAR OF PUBLICATION (1992–2005)

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
Herbert and Martinez (1992)	1990 State: PA	Race	Closure status (status 26, 28, 08, or 30) Employment (quality of employment)	Compared to other racial groups, Whites were more likely to be eligible for VR services and when accepted more likely to be successfully closed (χ^2 (3, n = 30,334) = 257.7***, Cramer's V = .09). Racial differences in quality of employment were small.
Dziekan and Okocha (1993)	1985–1989 Midwest state	Race (minority and majority)	Acceptance	Whites were accepted to VR more than minority groups for each of the 5 years (1985–1989) examined. Blacks and Hispanics were least likely to be accepted. χ^2 (1, n = 13,430) = 149.74***, ϕ = .10 χ^2 (1, n = 13,538) = 139.23***, ϕ = .10 χ^2 (1, n = 13,311) = 118.71***, ϕ = .09 χ^2 (1, n = 17,368) = 266.06***, ϕ = .12 χ^2 (1, n = 18,320) = 241.56***, ϕ = .11
Feist-Price (1995)	1990–1991 Southeast state	Race	Acceptance Services (type, costs) Closure status (26, 28, reason for	Whites were accepted for VR more often than Blacks. Whites were closed successfully more frequently than Blacks (χ^2 (5, n = 52,028) = 16.89**, Cramer's V = .01). Among successfully closed consumers, Whites

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
			unsuccessful closure) Employment (weekly earnings)	obtained higher-paying jobs (χ^2 (528, n = 11,116) = 890.92**, Cramer's V = .28).
Spitznagel and Saxon (1995)	1992 State: FL	Race Gender Age	Services (costs and types: evaluation or training)	Asian groups received more evaluations compared to any other group (χ^2 (3, n = 69,096) = 16.53**, Cramer's V = .01). Whites and Blacks received an equal percentage of evaluations. There was racial variation in types of vocational training received (χ^2 (9, n = 53,903) = 1,012.45***, Cramer's V = .13). Native Americans and Asians received more business vocational training compared to other groups. Asians and Blacks received more work-adjustment training. Asians received job coaching least frequently. Overall, on-the-job training was least used.
Walker, Ashbury, Rodriguez, and Saravanabhavan (1995) Unpublished	1991 National	Race Disability type RSA region Education Gender Time in VR Disability x Region	Services (number, costs) Employment (quality, weekly earnings)	There were no substantial racial differences in the number of services provided. Among successfully closed consumers, Whites had higher service costs (i.e., expenditures) compared to other racial groups. Among racial/ethnic groups, Asians had the highest service costs; however, the effect size was small. In addition, time in VR and number of

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
		(interaction) Status 26 (range restriction)		services were stronger predictors of costs. Whites and Asians had better employment outcomes (i.e., higher weekly earnings), but they also were more educated and more economically independent, received more services, and had greater expenditures. Results indicated racial variation across RSA regions. Race was a significant influence in regions 2, 4, 6, 7, and 10. The authors report racial variations were more common among subjective disabilities rather than physical disabilities.
Wheaton (1995)	1993 Midwest state	Race	Acceptance	There was no difference in the proportion of Whites and Blacks found eligible for VR (χ^2 (1, n = 2,404) = 6.61, ϕ = .052, λ = .04, ϕ^2 = .3%).
Peterson (1996) Dissertation	1994 State: Nevada	Race Earnings at application Employment status at application Primary disability Gender	Acceptance Closure status (26, 28, 08, or 30) Employment outcome (predictors of status 26)	There were no statistically significant differences in VR acceptance or closure status. The three strongest predictors for competitive employment (status 26) were case-service expenditure (β = .2483, *t* = 11.77), provision of on-the-job training (β = .2045, t = 11.52), and training in vocational or business school (β =.1576, *t* = 8.94). White racial status was also a predictor (β =.0498, *t*

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
		Age		= 2.85) for competitive employment.
Wheaton, Wilson, and Brown (1996)	1994 Midwest state	Race Gender Closure status (26 or 28) (all predictors were used to form interaction terms)	Services (number, types)	Blacks received more services than Whites. In particular, Blacks received more adjustment training (z = -6.97), transportation (z = -8.87), and maintenance services (z = -10.09). Whites received higher rates of restoration services (z = 5.12) and college-level training (z = 6.75) compared to Blacks. No racial differences were reported in diagnostic services, business or vocation training, on-the-job training, miscellaneous training, counseling, job referral, job placement, or other services.
Wheaton, Finch, Wilson, and Granello (1997)	1995 Midwest state	Race Gender Closure status (26, 28) Race x gender (interaction) Race x closure status	Services (number, types, pattern)	Blacks who were successfully closed received more services (5.25) than Whites (4.88) (F = 4.00*, eta = .04, power = .51). Blacks who were not successful also received more services (3.84) compared to Whites (3.80). The authors describe five clusters of services (i.e., patterns). Blacks received more comprehensive services (cluster 1) and minimal services (cluster 5). Whites received more counseling-only services (cluster 4) (χ^2 (4, n = 710) = 23.62***, Cramer's V = .18, power = .99).

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
Wilson (1997) Dissertation	1996 State: OH	Race Accepted to VR (range restriction) Work status at referral Education level (LTHS, HS, GTHS)	Acceptance Services (number, type) Closure status (successful closure status, reason for unsuccessful closure) Employment (weekly earning at closure)	Blacks received more services than Whites (t = 5.966***); however, the association was small (r = .088). Blacks received more of the following services: adjustment training, maintenance, and transportation. Whites received more restoration, college, and diagnosis services. There were no statistically significant differences in VR acceptance rates between Blacks and Whites (χ^2 (2, n = 16,976) = .135, ϕ = -.011). Blacks who were ineligible for VR were more frequently closed for "failure to cooperate" and "cannot locate." Whites were more likely closed for "handicap too severe," "no vocational handicap," "refused services," and "other" (χ^2 (2, n = 3,460) = 92,756*, Cramer's V = .164). Whites reported higher earnings ($6.89/hr) after successful closures compared to Blacks ($6.14/hr) ($t$ = 6.404*).
Staten (1998) Dissertation	1992–1997 State: IA	Race (majority and minority) Work status at referral Primary disability Gender	Acceptance Services (number, cost) Closure status (status 26, 28)	Minorities had higher VR acceptance rates over the 6-year period (χ^2 = 12.34*). There were no racial differences in the number of services provided over the 6-year period (F = 1.660, df = 5, p = .141). Minorities had a higher percentage of successful vocational outcomes (χ^2 (5, n = 40,449) = 19.3***,

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
		Age Education level (LTHS, HS, GTHS)		Cramer's V = .02). Predictors of success were job finding, counseling, and cost of services for majority and minority consumers.
Wilson (1999a)	1996 Midwest state	Race	Acceptance	There was no statistically significant relationship between race and VR acceptance status (χ^2 (2, n = 16,976) = .135, ϕ = -.011).
Wilson (1999b)	1996 Midwest state	Race	Employment outcome (hourly wages, weekly hours worked)	Blacks earned about 75 cents less per hour than Whites after successful closure (*t* = 6.404**** (CI = .52–.98). There were no racial differences between groups in hours worked (*t* = .499). Race and wages (*r* = .070) and race and hours worked (*r* = .014) were associated, but the relationships were weak.
Wilson, Jackson, and Doughty (1999)	1996 Midwest state	Race Ineligible for VR (range restriction)	Closure status (reasons for unsuccessful closure)	Blacks were more likely to be closed in the categories "unable to locate" (11.5% vs. 5.3%) and "failure to cooperate" (29.2% vs. 19.6%). Whites were more likely to be closed in the categories "handicap too severe" (4.5% vs. 2.3%), "refused services" (27.1% vs. 23.5%), and "no vocational handicap" (9.3% vs. 5.9%) (χ^2 (2, n = 3,460) = 92.756*, Cramer's V = .164).

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
Patterson et al. (2000)	1997 Southeast state	Race Severity of disability Education level Geographic region/district Race x district (interaction)	Services (costs) Closure status (26, 28)	Whites had higher service costs ($2,478.60) compared to Blacks ($2,095.51) ($F$ (1, 14,028) = 69.42**). Whites had more successful closures (60.3%) compared to Blacks (54.7%) (F (1, 14,026) = 31.02**). Race (White) interacts with geographic region (i.e., district) for costs of services (i.e., expenditures) (R^2 = .169%), and race interacts with geographic region on closure status. Whites were more likely to attain successful closure in some districts (R^2 = .1%).
Wilson (2000)	1996 Midwest state	Race Education level Work status at application Primary source of support	Acceptance	Whites were more likely to be accepted to VR compared to Blacks, controlling for other variables (χ^2 (6, n = 12,855) = 35.23***, Nagelkerke R^2 = .002).
Jackson and Wilson (2001)	1996 Midwest state	Race Education level (LTHS, HS, GTHS)	Closure status (status 26, 28, 08, or 30)	Whites were more likely to be accepted to VR and successfully closed (status 26) compared to Blacks (χ^2 (2, n = 17,466) = 109.28***, Cramer's V = .079).
Wilson, Harley, and Alston (2001)	1998 State: MI	Race Education level (LTH, HS,	Acceptance	Blacks with a high school diploma were about 5% less likely to be accepted for VR compared to Whites in Michigan during fiscal

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
		GTHS)		year 1998 (χ^2 (1, n = 4,575) = 9.811**, ϕ = .046, $\phi 2$ = .2%).
Capella (2002)	1997 National	Race Gender Severity of disability Age Education level Race x gender (interaction)	Acceptance Closure status (26, 28) Employment quality (high versus low)	Whites were 1.5 times more likely to be accepted to VR compared to Blacks (b = -.403, Exp (B) = .668** (CI = .58–.77). Whites were 1.25 times more likely to be closed successfully (i.e., status 26) compared to Blacks (b = -.219, Exp(B) = .803** (CI = .73–.89) and 1.73 times more likely to be closed compared to American Indians (b = -.548, Exp(B) = .578* (CI = .37–.91). Hispanics were 1.77** times more likely to receive higher-quality employment outcomes compared to Whites (CI = 1.25–2.52). The race by gender interaction was not significant.
Wheaton and Hertzfeld (2002)	1998 National	Race Severity of disability Case expenditures Assistive technology Number of services Time in VR	Closure status (26 or 28)	Whites fared better than all racial groups in terms of successful closure, with odds ranging from 1.2 to 1.5. American Indians were least likely to be successful (b = -.41, Exp(B) = .66****), followed by Blacks (b = -.33, Exp (B) = .72****) and Hispanics/Asians (b = -.19, Exp(B) = .83****).

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
Wilson, Alston, Harley, and Mitchell (2002a)	1998 National	Race Gender Source of support Employment at application	Acceptance	Blacks were 2.12* times more likely to be accepted to VR compared to Whites. Conversely, Whites were 1.78 times more likely than Asians to be accepted to VR (b = -.58, Exp(B) =.561*). The overall model Nagelkerke R^2 = .053 for acceptance. The Nagelkerke R^2 = .026 for race.
Wilson, Turner, and Jackson (2002b)	1996 Midwest state	Race Status 26 (range restriction)	Services (types)	Race and services are dependent. Blacks were more likely to receive transportation (z = -10.3), maintenance (z = -12.0), and adjustment services (z = -6.6). Whites were more likely to receive college (z = 7.1), restoration (z = 6.4), and diagnostic services (z = 4.5).
Wilson (2002)	1998 National	Race	Acceptance	VR acceptance and racial status are dependent on each other (χ^2 (3, n = 162,590) = 88.87***, Cramer's V = .023). Whites were more likely to be accepted to VR compared to Blacks.
Wilson (2003) Unpublished	1998 National	Race (categories) Severity of disability Education level (LTHS, HS,	Acceptance	Significant disability was the strongest predictor of VR acceptance (χ^2 = 95.3828***, ϕ = .28). The second-strongest predictor was race (Black) (χ^2 = 9.8207 *, ϕ = .09), followed by education level, monthly public

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
		GTHS) Monthly public assistance in dollars (0–200, 201–400, 401–600, 601–999) Martial status (married, widowed, divorced, separated, never married)		assistance at application, and martial status.
Wilson (2004)	1998 National	Race (categories) Type of disability (etiology unknown) Severe disability Age Education level (H.S. graduate >) No earnings 1 week prior to application	Acceptance	Asians were more likely to be accepted to VR than Blacks (χ^2 (3, n = 1,200) = 12.612**, Cramer's V =.103, Cramer's V^2 = .010). There were no differences between other racial groups.
Chan, Wong, Rosenthal,	2001 National	Race Gender	Acceptance, Closure status	VR acceptance rates for Whites and Asians were approximately 5% higher than Blacks,

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
Kundu, and Dutta (2005)		Severity Age Education level (special education, LTHS, HS, GTHS)	(reasons for unsuccessful closure)	Hispanics, and American Indians. Severity of disability was the strongest predictor of VR acceptance (χ^2 = 127.49***). Race was the second most important factor. Blacks were closed as "failure to cooperate" most frequently compared to other groups. Differences in acceptance were greater for racial/ethnic groups when a non-severe disability was present. Asians and Hispanics had the highest acceptance rates, and Blacks had the lowest (Race χ^2 92.33***). Blacks who completed special education had relatively high acceptance rates (97%) (χ^2 7.84**). White consumers older than 65 had the highest acceptance rates.
Park, Kim-Rupnow, Stodden, and Starbuck (2005)	2000 National	Race	Closure status (08, 28, 26)	Whites were accepted to VR at higher rates than Asians. Whites were more likely than Asians to be closed with an employment outcome (χ^2 (2, n = 1,000) = 7.38*, Cramer's V = .08).
Wilson and Senices (2005a)	1998 National	Hispanic ethnicity	Acceptance	Hispanics were accepted to VR at a much higher frequency than non-Hispanics (χ^2 (1, 20,000) = 6454.130***, ϕ = -.568). Hispanic ethnicity accounted for 32% of the explained variance in VR acceptance (ϕ^2 = .32). A

Author (Year)	RSA 911 Dataset	Predictors	Criterions	Main Findings
				substantial percentage of Hispanics in VR reported their race as White (91.5%).
Wilson (2005)	2001 National	Race Ethnicity (Hispanics) Age Gender	Acceptance Closure status (26, 28, 30, 38)	Hispanics who identified their race as White were accepted to VR and closed successfully more often than Hispanics who identified their race as Black (χ^2 (1, n = 8,000), 239.47***). More than 92% of Hispanics identified as White, and 5.0% identified as Black. Among consumers closed as unsuccessful, Hispanics who reported their race as Black were more likely to be closed as "ineligible"; Hispanics reporting their race as White were more likely to be closed from "extended evaluation" (χ^2 (1, n = 8,000), 11.25***). Blacks (non-Hispanic) ages 17–30 were less likely to be accepted to VR (χ^2 (1, n = 8,000), 83.13***). Whites (non-Hispanics) were more likely to be accepted and successfully closed. Gender was not statistically significant.

Note. Negative *z* scores indicate Blacks received a higher number of services. Positive *z* scores indicate Whites received a higher number of services. *$p < .05$, **$p < .01$, ***$p < .001$. Quality of employment = categories of higher paying/status outcome (i.e., competitive wages) versus lower paying/status outcome (i.e., sheltered workshop). LTHS = less than high school; HS = high school graduate; GTHS = greater than high school (i.e., some college or more). Minority = one or more non-white racial/ethnic groups collapsed. Status 26 = successfully rehabilitated; Status 28 = accepted to VR but closed unsuccessfully; Status 08 = not accepted to VR. CHAID = chi-square automatic interaction detection. Inclusion criteria for

Appendix A: empirical research published since 1992 and utilizing RSA 911 data. All studies had a primary focus on race/ethnicity and VR acceptance, services, closure, or employment outcomes. All studies utilized statistical tests to assess racial or ethnic variation.

APPENDIX B: TEST STATISTICS CALCULATED FOR REVIEW

Author (Year)	Test Statistic Calculated for Review	Calculation Technique
Wilson (2003)	Phi coefficients (ϕ)	$\sqrt{\frac{\chi^2}{N}}$
Dziekan and Okocha (1993)	Phi coefficients (ϕ)	
Feist-Price (1995)	Cramer's V	$\sqrt{\frac{\chi^2}{N-K}}$
Park et al. (2005)	Cramer's V	
Spitznagel and Saxon (1995)	Cramer's V	
Staten (1998)	Cramer's V	
Herbert and Martinez (1992)	Cramer's V	
Patterson et al. (2000)	R^2	$\frac{\text{Sum of squares factor A}}{\text{Sum of squares total}}$

APPENDIX C: FORMULAS FOR CONSTRUCT RELIABILITY AND VARIANCE EXTRACTED

	Formula
Construct reliability	$H = \dfrac{1}{1 + \dfrac{1}{\dfrac{\ell_1^2}{(1-\ell_1^2)} + \ldots + \dfrac{\ell_p^2}{(1-\ell_p^2)}}}$
Variance extracted	$\dfrac{\sum (\text{standardized loading})^2}{p}$

Note. For construct reliability, H = coefficient H. The script style l = standardized loading. For variance extracted, p = number of observed variables in measurement model.

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Vita

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